ARI Contractor Report 2008-01

Feasibility of Developing a Common U.S. Army Helicopter Pilot Candidate Selection System: Analysis of U.S. Air Force Data

Diane L. Damos and R. Bruce Gould
Damos Aviation Services, Inc.

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14. ABSTRACT *(Maximum 200 words)*:
The U.S. Army's aviator candidate pool, unlike the pools for the U.S. Air Force (USAF) and U.S. Navy (USN), includes military enlisted personnel and civilians, many of whom do not have a 4-year college degree. Existing tests, such as the Air Force Officer Qualifying Test (AFOQT), may be too difficult for a substantial subset of Army aviator candidates, failing to produce a sufficient spread of scores at selection points. The analyses evaluated the difficulty of the AFOQT for a sample of USAF personnel that should be similar in education to the U.S. Army aviator applicant populations. The analyses compared score distributions of the AFOQT subtest and composite scores for different sample sources. The AFOQT was more difficult for the Air Force enlisted personnel than for other commissioning source applicants. However, the subtest and composite score distributions are sufficient to discriminate well between enlisted personnel if the AFOQT or a similar aptitude test is used for selection. On the highly timed subtests of the Pilot Composite, such as the Instrument Comprehension and Table Reading tests, there is almost no difference between the examinee subpopulations.

15. SUBJECT TERMS
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September 2007

Army Project Number	**Personnel, Performance**
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FEASIBILITY OF DEVELOPING A COMMON U.S. ARMY HELICOPTER PILOT CANDIDATE SELECTION SYSTEM: ANALYSIS OF U.S. AIR FORCE DATA

EXECUTIVE SUMMARY

Research Requirement:

Personnel Decisions Research Institute (PDRI), with two subcontractors – Damos Aviation Services (DAS) and the American Institutes for Research (AIR)—is developing and validating a selection system for U.S. Army helicopter pilot candidates. One of the project's stated goals is the development of a selection battery that can be administered using the Internet. The project staff is reviewing pilot selection systems currently used by the U.S. Air Force (USAF) and the U.S. Navy (USN) to determine if the existing pilot selection tools would be relevant and useful for selecting Army aviators.

This report summarizes analyses of the Air Force Officer Qualifying Test (AFOQT) and addresses the basic question, "Can a common selection system be developed from existing tests that has sufficient variance to discriminate among pilot candidates from both the enlisted and officer populations?" The U.S. Army's aviator candidate pool, unlike the aviator candidate pools for the USAF and USN, includes military enlisted personnel and civilians, many of whom do not have a four-year college degree. As a result, there is some concern that existing tests such as the USAF's AFOQT and the USN's Aviation Selection Test Battery (ASTB) may be too difficult for a substantial subset of Army aviator candidates, and thus would not produce a sufficient spread of scores at important selection points.

Procedure:

The normative sample for the soon-to-be-implemented AFOQT Form S was used for the current investigation. The sample consisted of Basic Military Training (BMT) enlisted personnel likely to apply for the Airman Education and Commissioning Program, Air Force Reserve Officer Training Cadets (AFROTC), and Officer Training School (OTS) cadets. The AFOQT analyses evaluated the difficulty of the AFOQT for a sample of USAF personnel that should be similar in education level to the U.S. Army aviator enlisted, ROTC, and Officer Candidate School applicant populations. The primary analyses compared score distributions of the AFOQT subtest and composite scores for the different sample sources: BMT, AFROTC, and OTS. Secondary analyses compared the AFOQT and Armed Services Vocational Aptitude Battery (ASVAB) components for those with available ASVAB data.

Findings:

As expected, the AFOQT was more difficult for the Air Force enlisted personnel than for other commissioning source applicants. However, the subtest and composite score distributions are sufficient to discriminate well between enlisted personnel if the AFOQT or a similar aptitude test is used for selection. On the highly timed subtests of the Pilot Composite, such as the

Instrument Comprehension and Table Reading tests, there was almost no difference between the examinee subpopulations.

A common selection system for all Army helicopter pilot applicants appears to be practical, but separate group norms probably will be required so that individual applicants are rank ordered or eliminated based on the applicant's membership group. Direct conversion from ASVAB to AFOQT results is not recommended except as an interim estimate of how the enlisted personnel are likely to do on the AFOQT, particularly the new Pilot Composite.

Utilization and Dissemination of Findings:

This work informs the decision process for development of a selection instrument for Army aviation and its integration into the accession process. It directly affects the determination of suitability of existing instruments as part of the objective test battery. The Selection Instrument for Flight Training project research plan, milestones, products and recommendations for implementation were briefed to the Deputy Commander, U.S. Army Aviation Warfighting Center on 6 July 2006.

FEASIBILITY OF DEVELOPING A COMMON U.S. ARMY HELICOPTER PILOT CANDIDATE SELECTION SYSTEM: ANALYSIS OF U.S. AIR FORCE DATA

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Introduction

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Background

The AFOQT has been used to select all Air Force commissioning program applicants, except Air Force Academy and Medical Corps applicants, for the last 50 years. The AFOQT also has regularly been used to select non-academy candidates for undergraduate pilot training (UPT) and undergraduate navigator training (UNT) since its implementation. Currently, two parallel versions of AFOQT Form Q are used operationally. Since Form O was implemented in the early 1980s, the AFOQT has consisted of the 16 subtests shown in Table 1. Table 1 also shows five composites formed by adding the indicated subtest raw scores. The raw composite scores are then converted into percentile scores based on a 1978 normative sample. Forms O through Q required 4.5 hours to administer (Gould, 1978; Skinner & Alley, 2002).

Two revised parallel versions were developed as Form R and normed based on a new 2001 sample. Implementation of Form R was delayed until an effort to reduce the test length and test time was completed. The reduction effort concluded that five subtests (Reading Comprehension, Data Interpretation, Mechanical Comprehension, Electrical Maze, and Scale Reading) could be removed without losing significant variance or changing the factor structure of the test (Operational Technologies Corp, 2002). A new 11-subtest version of the AFOQT, Form S, was produced and placed in operation in Fall 2005 (Gould & Shore, 2003).

Table 1

AFOQT Forms O, P, and Q Subtests and Composites

Subtest	# of Items	Composites				
		Pilot	Navigator / Technical	Academic Aptitude	Verbal	Quantitative
Verbal Analogies (VA)	25	X		X	X	
Arithmetic Reasoning (AR)	25		X	X		X
Reading Comprehension (RC)	25			X	X	
Data Interpretation (DI)	25		X	X		X
Word Knowledge (WK)	25			X	X	
Math Knowledge (MK)	25		X	X		X
Mechanical Comprehension (MC)	20	X	X			
Electrical Maze (EM)	20	X	X			
Scale Reading (SR)	40	X	X			
Instrument Comprehension (IC)	20	X				
Block Counting (BC)	20	X	X			
Table Reading (TR)	40	X	X			
Aviation Information (AI)	20	X				
Rotated Blocks (RB)	15		X			
General Science (GS)	20		X			
Hidden Figures (HF)	15		X			
Total	380					

An additional investigation resulted in changes to the subtest composition of the Pilot and Navigator/Technical (NT) Composites as shown in Table 2 (Shore & Gould, 2003). Verbal Analogies was removed from the Pilot Composite, and Arithmetic Reasoning and Math Knowledge were added. Rotated Blocks and Hidden Figures were removed from the NT composite and Verbal Analogies was added. An experimental subtest, the Self Description Inventory, was added to Form S. The complete test, with the Self Description Inventory, requires 3.5 hours to administer.

These changes had an effect on the predictive validity of the Pilot and NT composites. Prediction of UPT attrition increased from $r = .10$ to .13 and prediction of T-37 training (the first stage of UPT), from $r = .29$ to .35. UNT performance prediction increased from $r = .33$ to .44. These correlations are uncorrected for restriction in range or unreliability. Their magnitude is particularly important for UPT because only about 12 % of candidates fail or terminate for any reason (medical, self-initiated elimination, academic failure, flying deficiency, manifestations of anxiety, or death). Therefore, truncation of scores has a significant depressing effect on the magnitude of the correlations.

Table 2

AFOQT Form S Subtests and Composites

Subtest	# of Items	Pilot	Navigator / Technical	Academic Aptitude	Verbal	Quantitative
		Composite				
Verbal Analogies	25		X	X	X	
Arithmetic Reasoning	25	X	X	X		X
Word Knowledge	25			X	X	
Math Knowledge	25	X	X	X		X
Instrument Comprehension	20	X				
Block Counting	20		X			
Table Reading	40	X	X			
Aviation Information	20	X				
Rotated Blocks	15					
General Science	20		X			
Hidden Figures	15					

Approach

Two sets of analyses were conducted. The first set of analyses compared score distributions of the AFOQT subtest and composite scores for three different sample sources: Basic Military Training (BMT), Air Force Reserve Officer Training Corps (AFROTC), and Officer Training School (OTS). In addition, gender and ethnic differences in subtest and composite scores were analyzed by examinee source using basic linear regression techniques. For these analyses, all the original 16 subtests included in the AFOQT Forms O through Q were analyzed rather than restricting the analyses to the 11 subtests included in the new AFOQT Form S. Raw scores were used in the analyses. The same data set was used in regression analyses to evaluate the impact of gender, ethnicity, and examinee source on test performance.

These analyses used the normative sample for AFOQT Form S. This sample of USAF personnel should be similar in education level to the U.S. Army aviator enlisted, ROTC, and Officer Candidate School applicant populations. The sample contained 509 enlisted personnel who took the AFOQT while they were in BMT and scored at the 50th percentile or higher on the Armed Services Vocational Aptitude Battery (ASVAB) Air Force General (G) composite. They were included in the normative sample to represent the enlisted personnel who take the AFOQT while applying for the Airman Education and Commissioning program and college students applying for the 2- or 4-year AFROTC scholarship programs. The sample also contained 679 AFROTC and 462 OTS cadets. The AFOQT normative data were collected in the spring and summer of 2001.

The second set of analyses investigated relationships between the AFOQT and ASVAB. These relationships are important in determining if ASVAB test scores can serve as selection indicators for Army enlisted personnel who apply as Army aviator candidates. In addition, the intercorrelations of the ASVAB subtest and composite scores and the AFOQT subtest and composite raw scores were computed for the enlisted personnel to permit project personnel to evaluate the common and unique variance relationships between the ASVAB and the AFOQT.

For these analyses, the normative sample was matched with ASVAB files for FY 2000 and 2001 accessions. The ASVAB subtest and composite scores then were extracted and added to the 2001 AFOQT normative data file. The total sample had 406 cases. All ASVAB scores used standard scores from the 1997 normative base, the only normative data base currently available for Air Force personnel.

Results

AFOQT Sample Characteristics

The basic characteristics of the AFOQT normative sample are shown in Table 3. This sample initially contained 1,650 cases. After the cases with missing background variables were removed, the final normative sample had 1,623 cases. Females comprised 20% of the sample. The normative sample was predominately White (78%). Blacks and Hispanics constituted 8% and 7% of the normative sample, respectively, with 1% of the sample composed of American Indians and 5%, of Asians. Thirty-one percent (31%) of the normative sample was obtained from BMT, 40% from AFROTC, and 28% from OTS. All of the cases in the normative sample had at least a GED or a high school diploma. The mean number of years of education was 13.66.

Table 3 shows the raw score mean, range of scores, and standard deviation for the five AFOQT composites and 16 subtests plus 11 demographic measures. The NT Composite is included in this and subsequent tables and graphs because Army aviator training may include a significant amount of navigation training. In such a case the Army may wish to combine the NT Composite with the Pilot Composite. Mean years of education for the OTS subsample was 16.4 because only college graduates can go to OTS. The mean years of education for the AFROTC subsample was 12.5, and for the BMT subsample, 12.7 years. The mean years of education for the AFROTC cadets was low because the AFROTC detachments tested freshmen. This fact explains why the AFROTC cadets score very differently on certain subtests from the enlisted personnel in the BMT subsample despite the similarity of their education levels. One individual in BMT reported having doctoral equivalent years of education. This is not unusual for Air Force basic enlisted personnel, and some individuals with college degrees go directly from basic training to OTS.

Table 3

AFOQT Normative Sample Statistics

Test	*n*	Statistics			
		Minimum	Maximum	Mean	*SD*
Composites					
Verbal	1623	11	74	45.67	12.83
Quantitative	1623	7	75	46.82	13.97
Academic Aptitude	1623	23	147	45.67	24.07
Pilot	1623	38	195	122.45	28.14
Navigator/Technical	1623	46	257	163.80	37.78
Subtests					
VA	1623	3	25	16.01	4.30
AR	1623	1	25	15.39	5.34
RC	1623	2	25	14.43	4.67
DI	1623	2	25	16.74	4.41
WK	1623	1	25	15.23	5.89
MK	1623	1	25	14.69	5.94
MC	1623	1	20	10.39	3.63
EM	1623	0	20	10.00	3.89
SR	1623	4	40	25.02	7.36
IC	1623	0	20	11.54	5.34
BC	1623	0	20	12.37	4.00
TR	1623	1	41	27.35	7.31
AI	1623	0	20	9.77	4.47
RB	1623	0	15	9.50	3.17
GS	1623	0	20	12.40	3.88
HF	1623	0	15	9.96	3.52
Demographics					
Years Education	1623	12	21	13.66	2.00
Male	1623	0	1	0.79	0.41
Female	1623	0	1	0.20	0.40
American Indian	1623	0	1	0.01	0.09
Asian	1623	0	1	0.05	0.21
Black	1623	0	1	0.08	0.28
Hispanic	1623	0	1	0.07	0.25
White	1623	0	1	0.79	0.41
BMT	1623	0	1	0.31	0.46
ROTC	1623	0	1	0.40	0.49
OTS	1623	0	1	0.28	0.45

Tables 4, 5, and 6 show the AFOQT score distribution statistics separately for the three--BMT, AFROTC, and OTS--sources. Many of the test score distributions will be shown graphically later in the report. The graphs make it easier to distinguish those composites and subtests that show little difference in test scores by source from those that show significant source differences.

Table 4

BMT Subsample Statistics

		Statistics			
Test	*n*	Minimum	Maximum	Mean	*SD*
Composites					
Verbal	509	11	72	38.51	12.03
Quantitative	509	7	70	38.20	11.22
Academic Aptitude	509	28	137	76.71	20.58
Pilot	509	11	176	107.00	23.32
Navigator/Technical	509	56	235	142.67	31.07
Subtests					
VA	509	4	24	14.01	4.16
AR	509	2	25	12.81	4.66
RC	509	3	24	12.50	4.55
DI	509	4	24	15.01	4.06
WK	509	1	25	12.00	5.37
MK	509	1	25	10.38	4.52
MC	509	1	18	9.25	3.32
EM	509	0	19	8.63	3.69
SR	509	4	39	22.41	6.99
IC	509	0	20	8.93	4.73
BC	509	0	20	11.24	3.90
TR	509	2	41	25.10	6.65
AI	509	0	19	7.44	3.08
RB	509	1	15	8.90	2.99
GS	509	1	19	10.18	3.42
HF	509	0	15	8.77	3.49
Demographic					
Years Education	509	12	21	12.65	1.15

Table 5

AFROTC Subsample Statistics

Test	*n*	Statistics			
		Minimum	Maximum	Mean	*SD*
Composites					
Verbal	652	652	73	47.38	11.70
Quantitative	652	12	75	52.47	11.70
Academic Aptitude	652	23	147	99.85	21.48
Pilot	652	44	195	127.84	24.83
Navigator/Technical	652	46	257	174.88	32.96
Subtests					
VA	652	3	25	16.65	4.06
AR	652	2	25	16.71	5.13
RC	652	2	25	15.30	4.37
DI	652	4	25	18.10	3.84
WK	652	2	25	15.43	5.41
MK	652	3	25	17.66	5.00
MC	652	2	20	10.73	3.47
EM	652	1	20	10.44	3.54
SR	652	8	40	26.10	6.46
IC	652	0	20	12.52	5.21
BC	652	1	20	12.56	3.71
TR	652	8	41	28.20	6.47
AI	652	1	20	10.65	4.40
RB	652	0	15	10.10	3.04
GS	652	1	20	13.64	3.49
HF	652	1	15	10.64	3.11
Demographic					
Years Education	652	12	19	12.53	1.06

Table 6

OTS Subsample Statistics

Test	*n*	Statistics			
		Minimum	Maximum	Mean	*SD*
Composites					
Verbal	462	15	74	51.16	11.63
Quantitative	462	10	75	48.33	14.14
Academic Aptitude	462	462	146	99.49	22.80
Pilot	462	38	194	131.87	30.36
Navigator/Technical	462	46	254	171.44	41.20
Subtests					
VA	462	6	25	17.31	3.99
AR	462	1	25	16.37	5.32
RC	462	2	25	15.35	4.58
DI	462	2	25	16.72	4.86
WK	462	2	25	18.49	5.16
MK	462	2	25	15.24	5.75
MC	462	1	20	11.18	3.85
EM	462	1	20	10.88	4.17
SR	462	4	39	26.38	8.17
IC	462	0	20	13.04	5.11
BC	462	1	20	13.33	4.22
TR	462	1	41	28.65	8.46
AI	462	0	20	11.10	4.88
RB	462	0	15	9.32	3.39
GS	462	0	20	13.09	3.84
HF	462	1	15	10.29	3.79
Demographic					
Years Education	462	12	21	16.37	0.87

Distributions of AFOQT Composite and Subtest Scores by Source

The distribution of BMT test scores on the Pilot Composite is the key issue of this investigation. The Pilot Composite, however, was changed with the implementation of AFOQT Form S in early 2005. The old Pilot Composite used unit weightings for its eight subtests. The new composite uses regression weights:

$$\text{Pilot Composite} = 1.2\text{AR} + 1.0\text{MK} + 1.9\text{IC} + 1.0\text{TR} + 2.4\text{AI}$$

Figure 1 shows a distribution of the total normative sample scores on the new Pilot Composite (P_NW). The mean is 106 and the distribution is somewhat platykurtic but nearly normal with a standard deviation of 30. Figure 2 shows the distribution of scores for the BMT subsample as slightly skewed to the right but suitable for making distinctions among members of this group. However, the mean is 86 or 2/3's of a standard deviation less than that of the total sample. The BMT subsample did much worse than the other groups, but the distinctions are sufficient for selection purposes _if_ the BMT examinees are compared only among themselves.

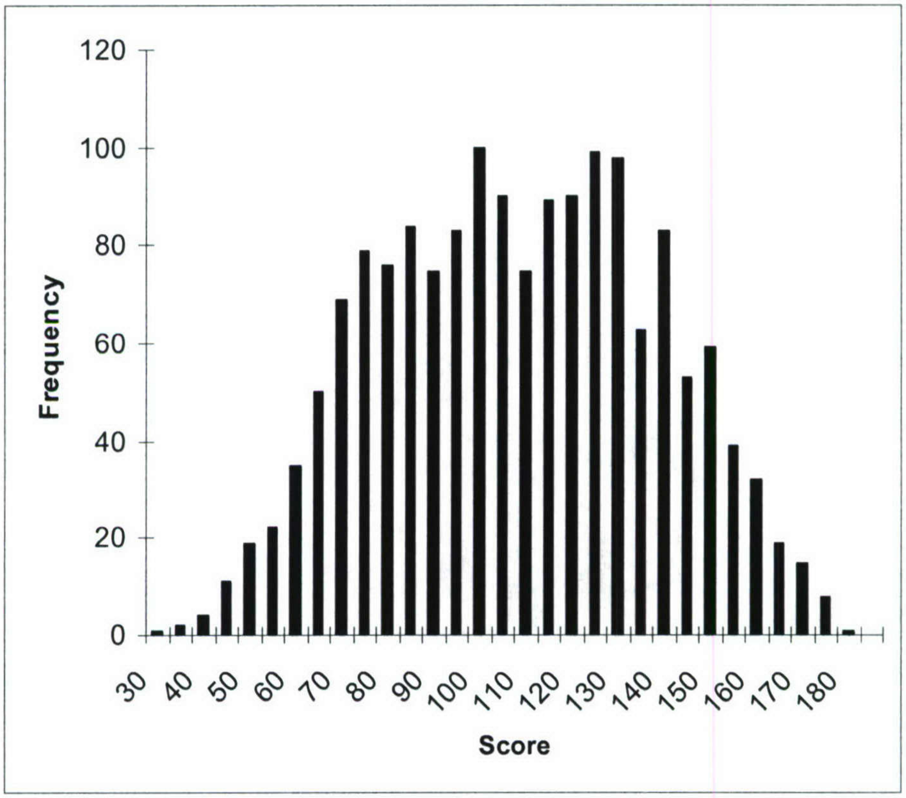

Figure 1. New Pilot Composite for total sample.

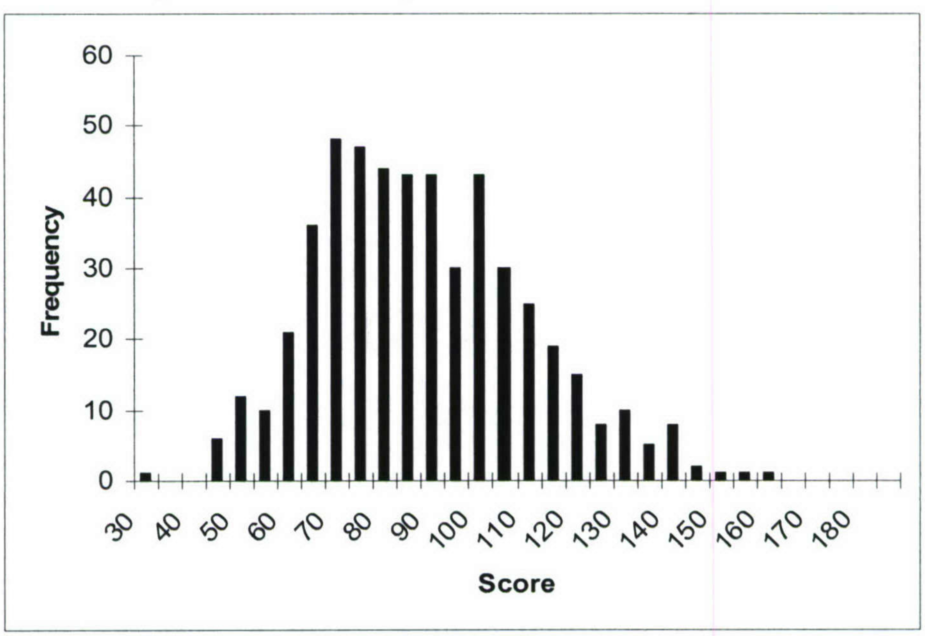

Figure 2. New Pilot composite for Basic Military Training (BMT) sample.

The new Pilot Composite distributions for the ROTC and OTS subsamples are shown in Figures 3 and 4. Their means are similar and their distributions are similar and slightly skewed to the left.

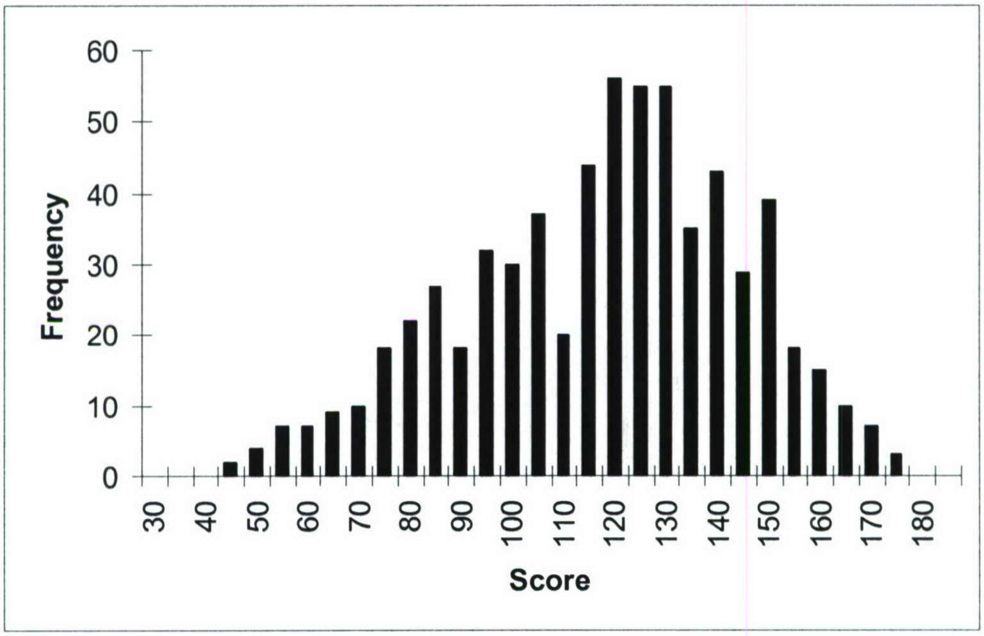

Figure 3. New Pilot Composite for AFROTC sample.

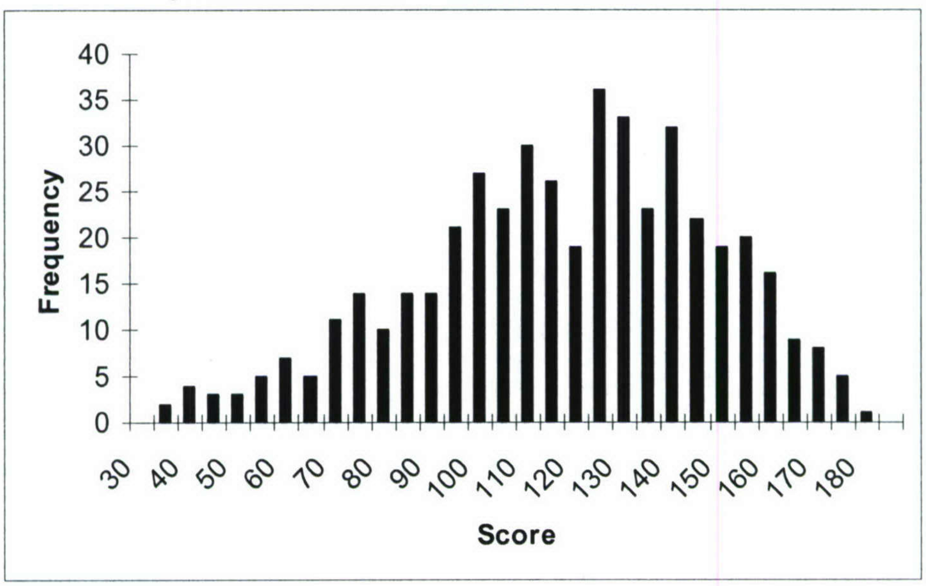

Figure 4. New Pilot Composite for OTS sample.

Score distributions for the old Pilot Composite are similar to those for the new composite for the total sample and the BMT subsample as shown in Figures 5 and 6. The means are higher with no apparent skewness, but the enlisted personnel again scored about 2/3's of a standard deviation lower than the total sample.

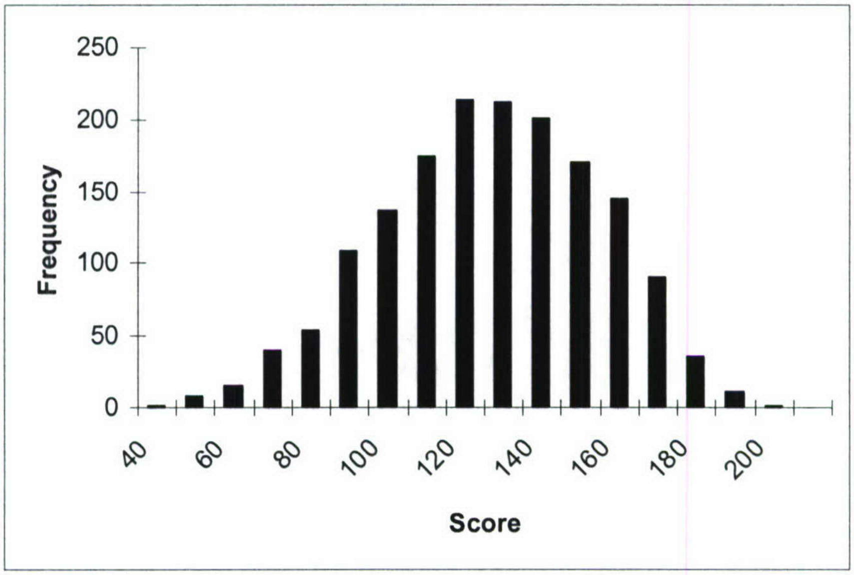

Figure 5. AFOQT Old Pilot Composite for total sample.

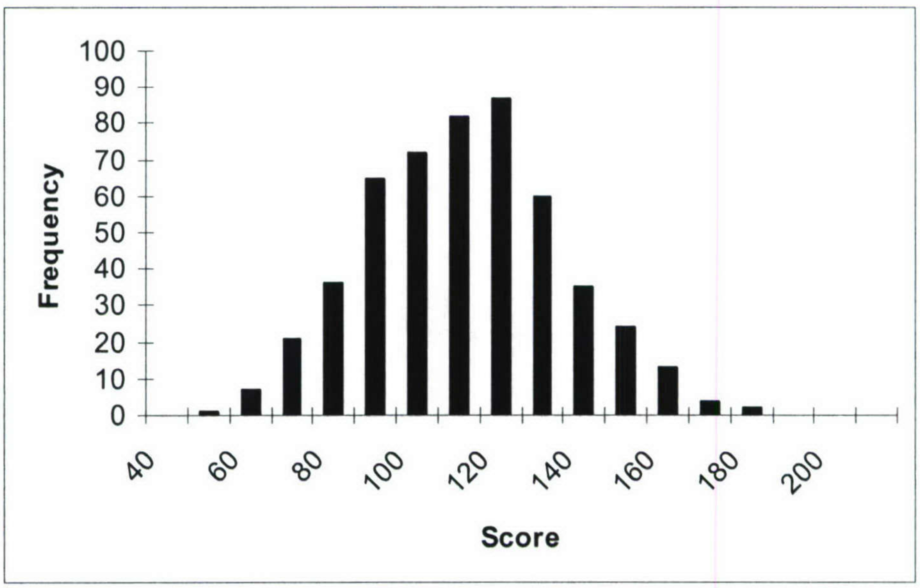

Figure 6. AFOQT Old Pilot Composite for BMT sample.

Figure 7 superimposes the distributions for all three sample sources on the graph for the old Pilot Composite. For Figure 7 and all subsequent figures, the percent is based on the total sample, not on each source. The AFROTC mean is lower than the OTS mean, and the BMT mean is lower than the other two. Nevertheless, the distributions are adequate to differentiate among candidates within each source. The pattern is similar for the NT Composite shown in Figure 8.

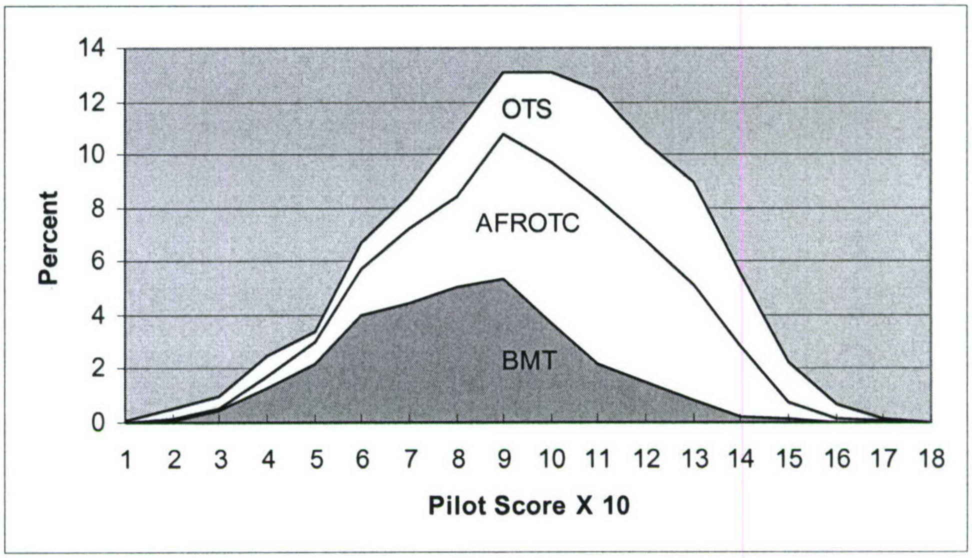

Figure 7. Old Pilot Composite for each source.

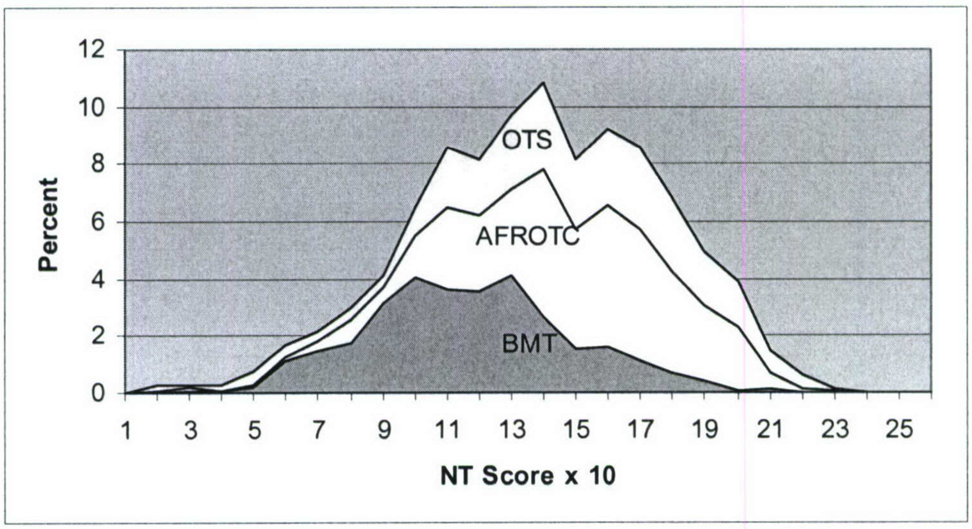

Figure 8. NT Composite for each source.

The distributions for the Verbal Composite in Figure 9 show that the mean OTS scores are higher than the AFROTC scores and the AFROTC scores are much higher than the BMT scores. Nevertheless, discrimination within sources is sufficient for use in selection. The same conclusions may be reached for the Quantitative Composite in Figure 10.

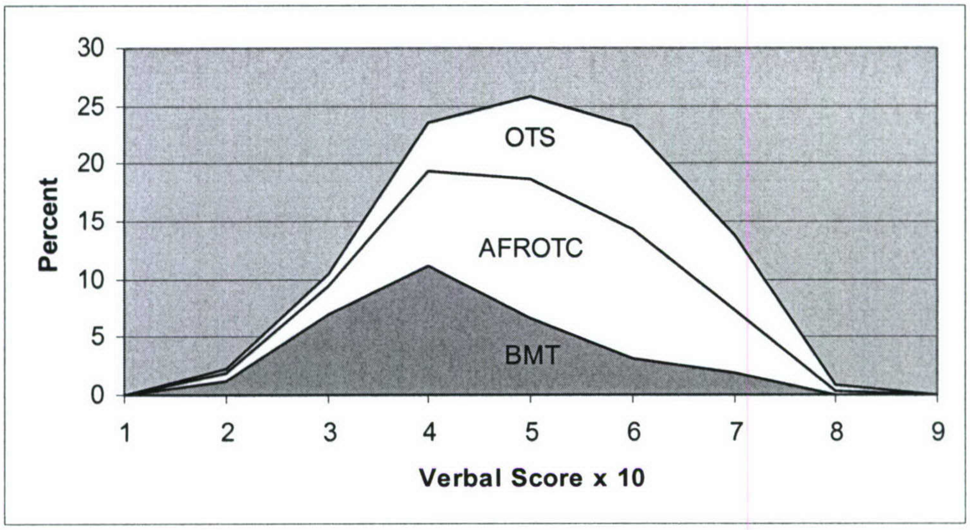

Figure 9. Verbal Composite for each source.

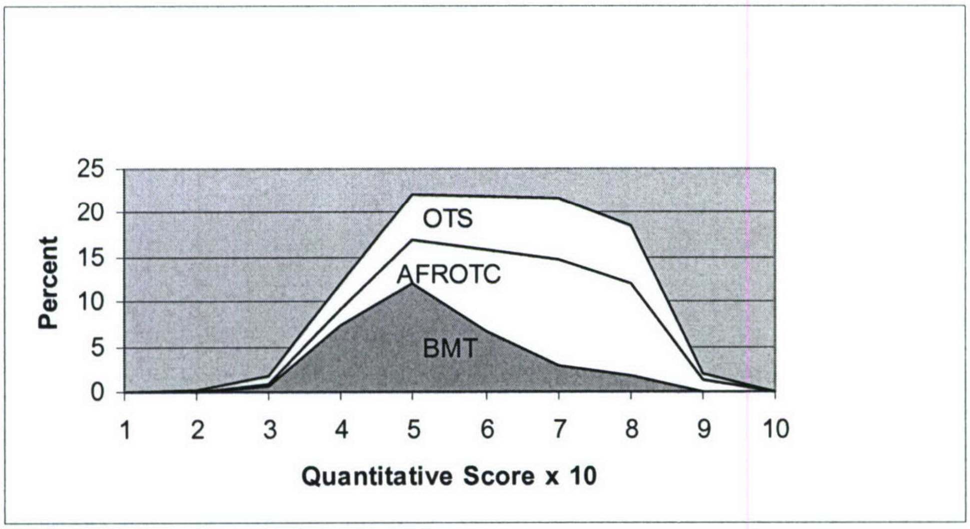

Figure 10. Quantitative Composite for each source.

Figures 11 to 26 superimpose the distributions for the three sources on each of the 16 subtests. In general the pattern of relationships is the same as the pattern for the composites: The source distribution shapes are very similar, suitable for use in selection, and BMT scores are slightly lower than scores from the other two sources. BMT scores are lowest on the verbal and quantitative composites, their contributing subtests (Verbal Analogies, Arithmetic Reasoning, Reading Comprehension, Word Knowledge, Math Knowledge, and Data Interpretation), and the General Science subtest but only slightly lower on most of the speeded subtests (see Figures 19 through 22). The distributions for the OTS have small ceiling effects on the Aviation Information, Block Counting, and Table Reading subtests. The OTS distribution shows a moderate ceiling effect on the Word Knowledge, Rotated Blocks, and Instrument Comprehension subtests. The distributions for the AFROTC show a small ceiling effect on the

Word Knowledge, Instrument Comprehension, and Rotated Blocks subtests. The Hidden Figures subtest (Figure 24) indicates a ceiling effect for the OTS and AFROTC cadets, but this subtest is no longer used in any of the composite scores.

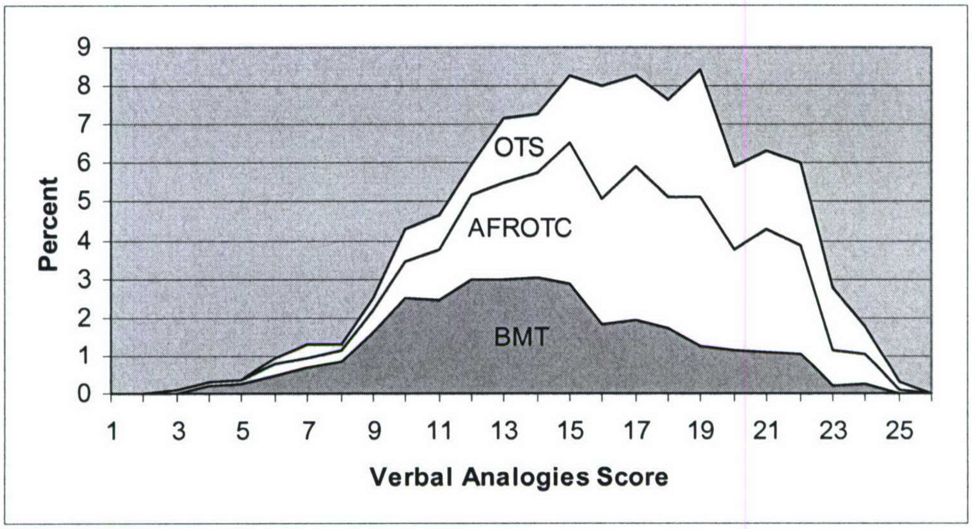

Figure 11. Verbal Analogies subtest for each source.

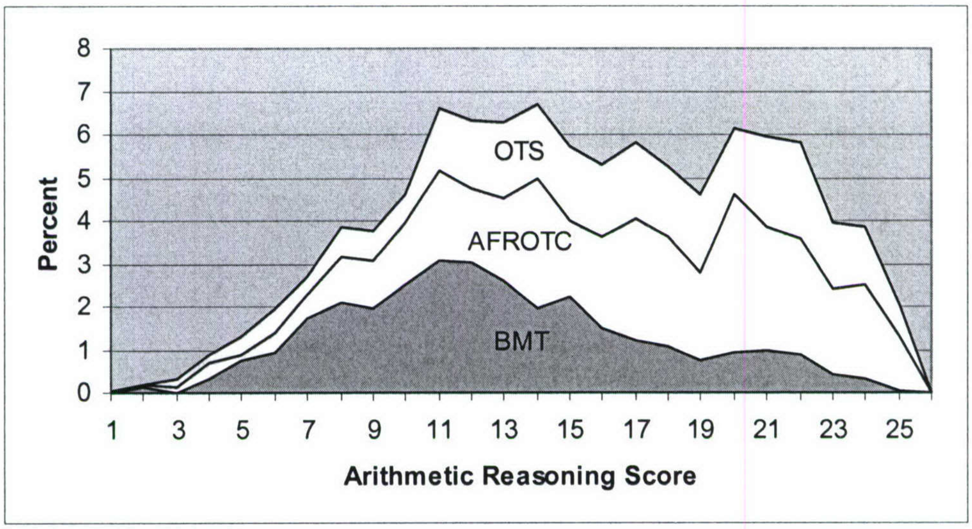

Figure 12. Arithmetic Reasoning subtest for each source.

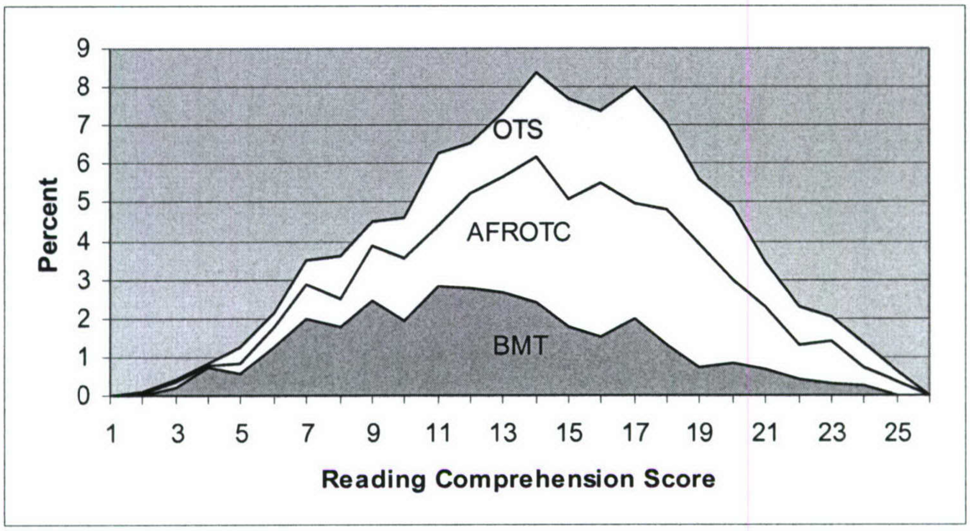

Figure 13. Reading Comprehension for each source.

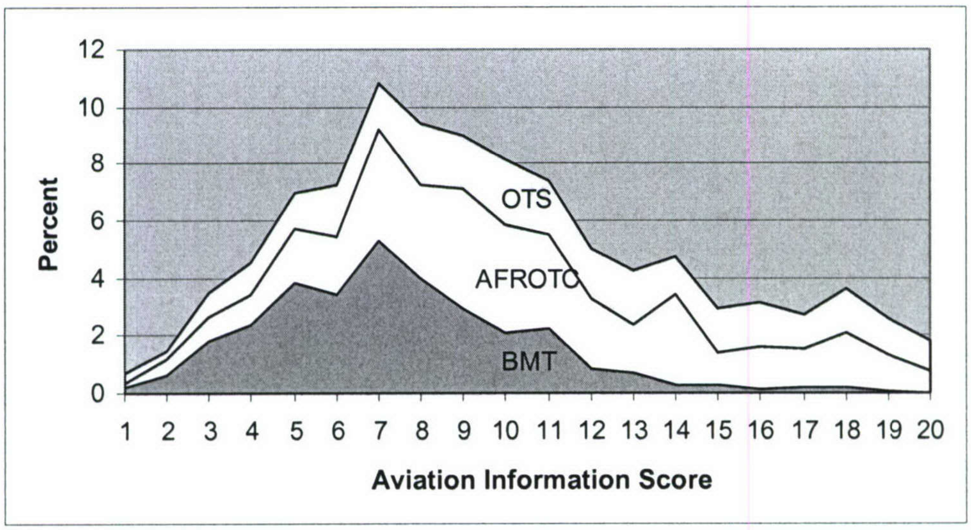

Figure 14. Aviation Information for each source.

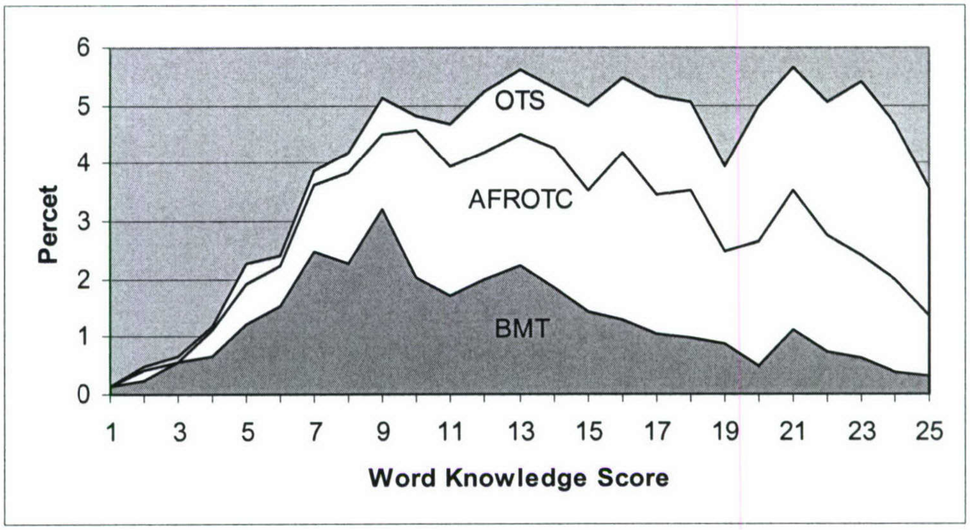

Figure 15. Word Knowledge for each source.

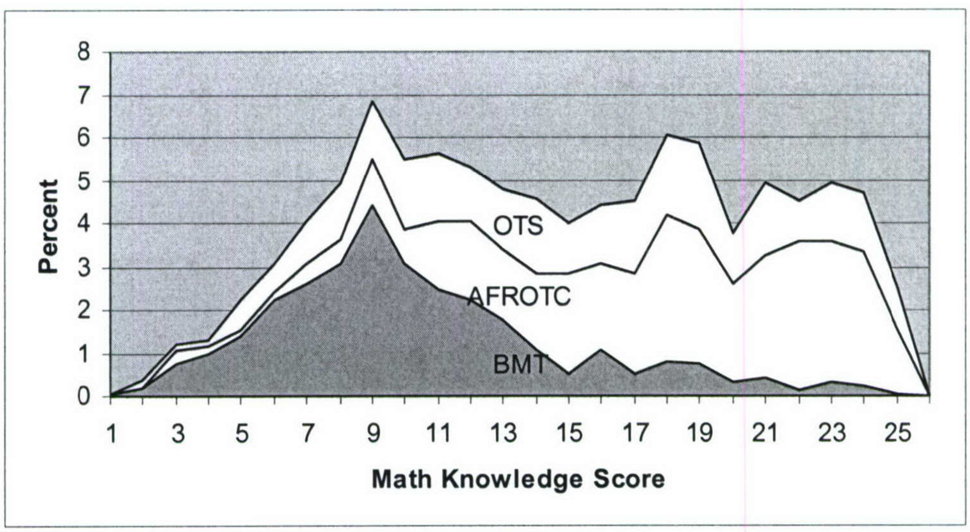

Figure 16. Math Knowledge for each source.

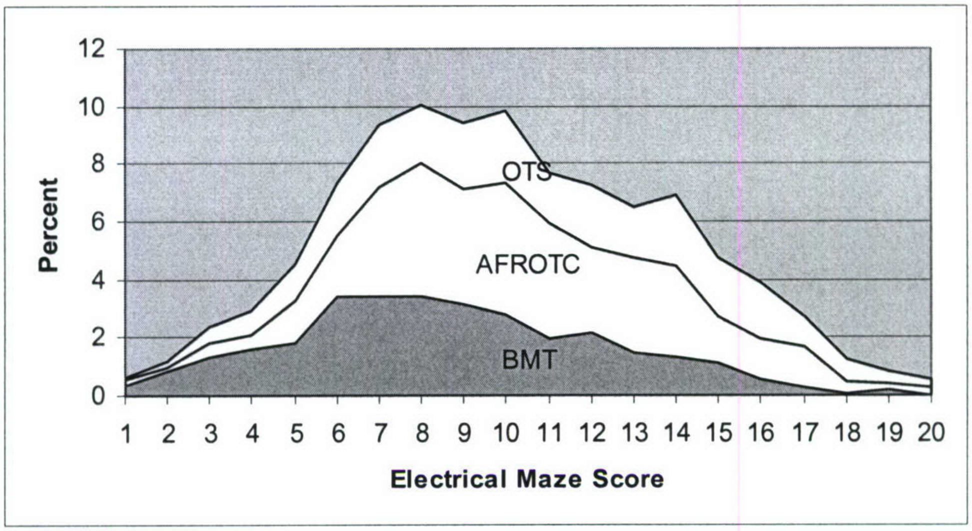

Figure 17. Electrical Maze for each source.

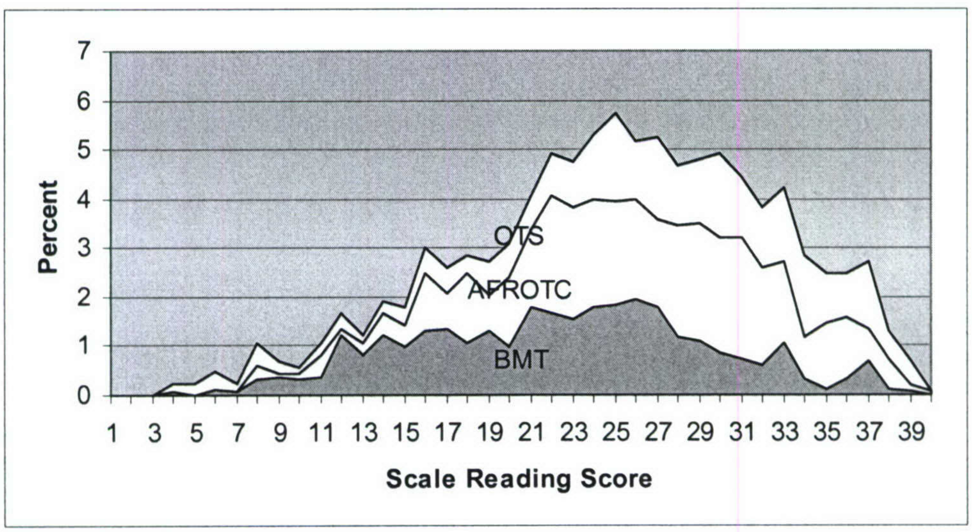

Figure 18. Scale Reading for each source.

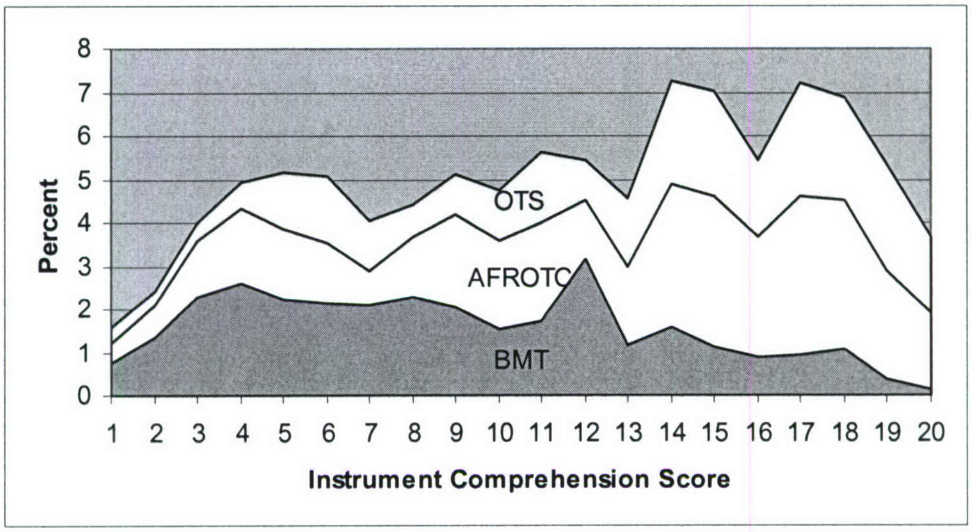

Figure 19. Instrument Comprehension for each source.

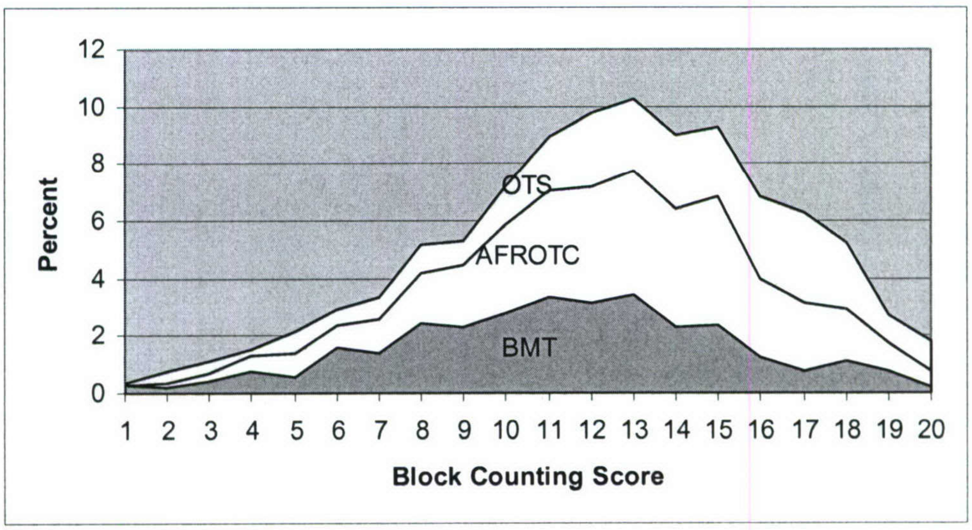

Figure 20. Block Counting for each source.

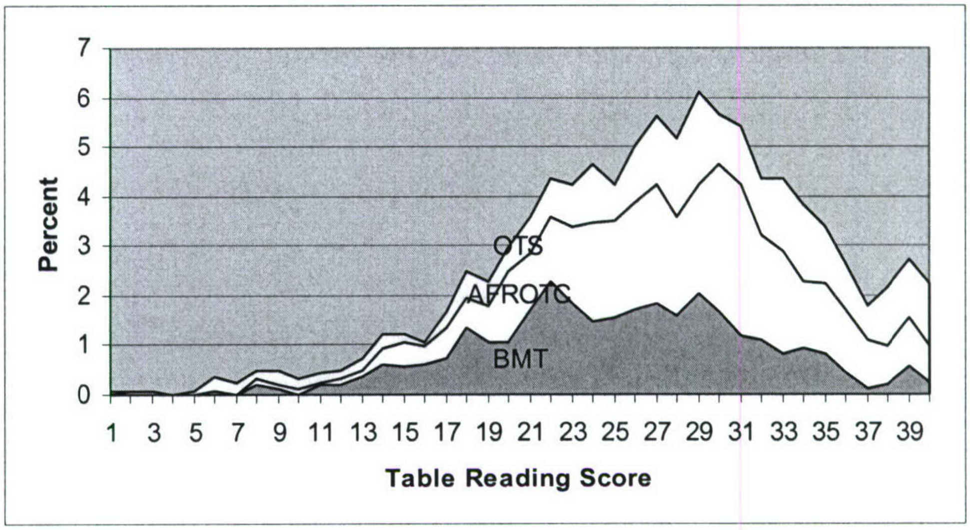

Figure 21. Table Reading for each source.

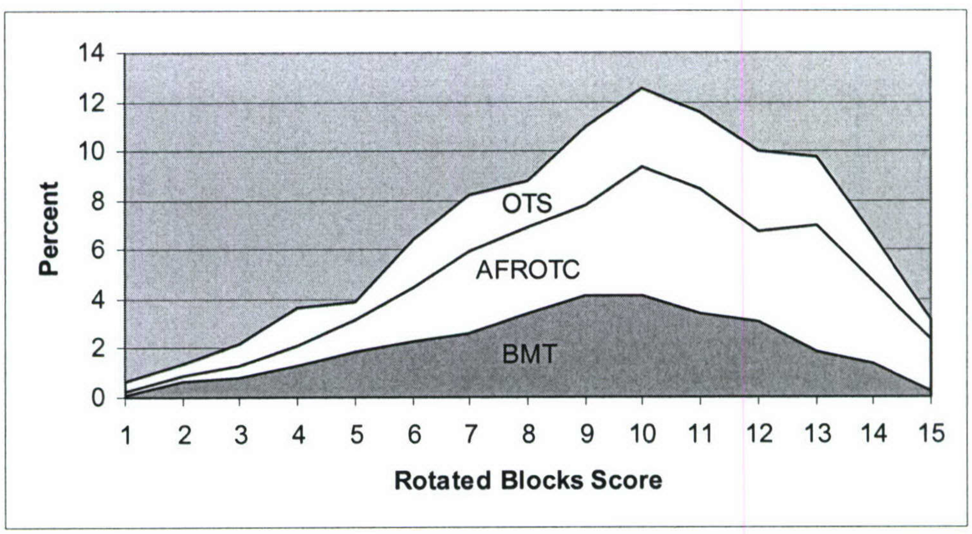

Figure 22. Rotated Blocks for each source.

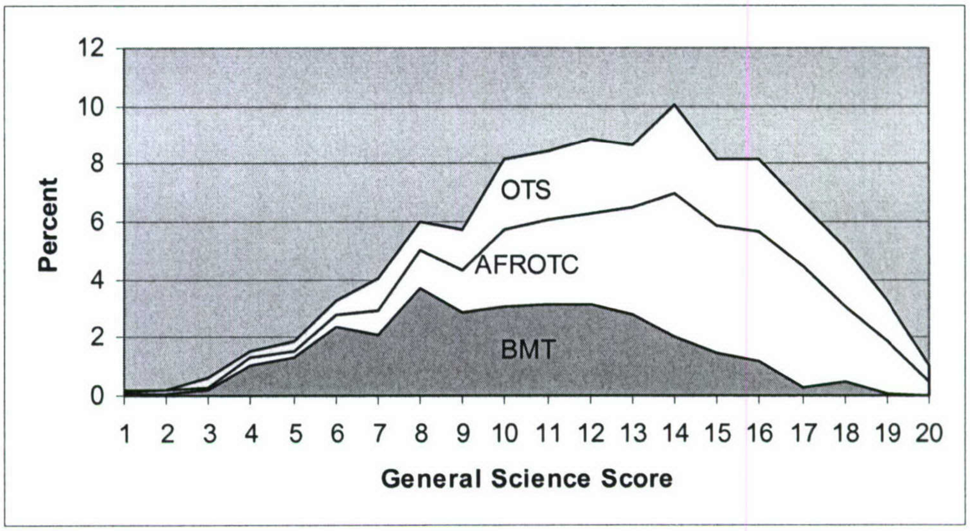

Figure 23. General Science for each source.

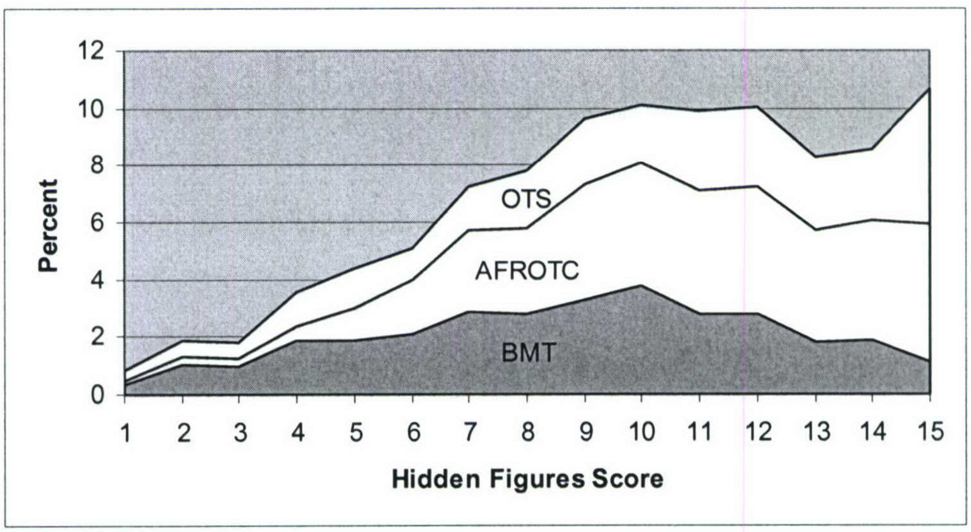

Figure 24. Hidden Figures for each source.

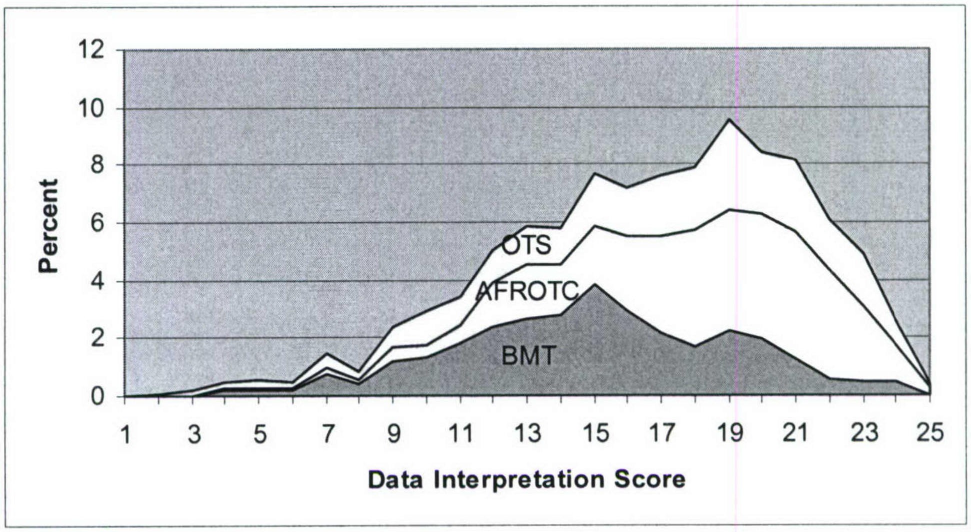

Figure 25. Data Interpretation for each source.

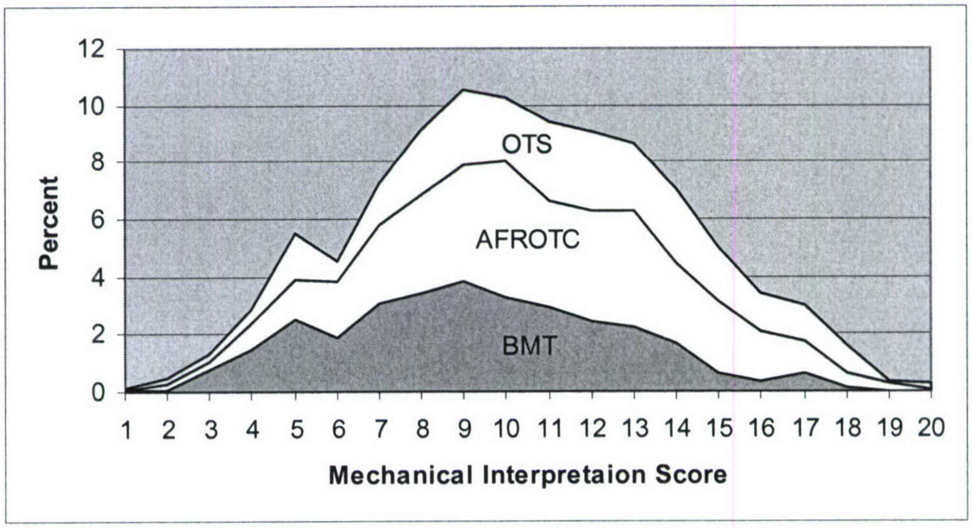

Figure 26. Mechanical Comprehension for each source.

Gender, Ethnicity, and Source Differences in AFOQT New Pilot Composite

To evaluate gender, ethnicity, and examinee source differences, dichotomous (1/0) variables were generated and iteratively regressed on the new Pilot Composite scores. For each analysis, the variables of interest (e.g., gender) were removed from the independent variable set and years of education and the effects of the other categories were held constant as shown in Table 7. Years of education was held constant to ensure that any new Pilot Composite score differences identified were not attributable to education level differences in gender, race, and source in the sample. The ethnic categories were American Indian, Asian or Pacific Islander, Black, Hispanic, and White. The other dichotomous variables were female, male, BMT, AFROTC, and OTS.

Table 7

Regression Summary

Model	Title	*R*	R^2	Restriction Tested	*df1*	*df2*	*F*	Sig.
1	Full	.603	.364					
2	Gender	.536	.288	Model 1 vs 2	1	1614	192.9	.001
3	Ethnicity	.552	.304	Model 1 vs 3	4	1619	38.2	.001
4	Source	.422	.178	Model 1 vs 4	2	1616	236.0	.001

Model 1 contains all the predictors: male, female, American Indian, Asian, Black, Hispanic, White, BMT, AFROTC, OTS, and years of education. The criterion is the new Pilot Composite. Model 2 removes the female and male variables. Model 3 replaces the gender variables and removes the ethnicity variables. Model 4 replaces the ethnicity variables and removes the source variables.

As indicated in Table 7, 36.4% of the variance in the new Pilot Composite can be accounted for by the gender, ethnicity, source, and years of education. Imposing the restriction on Model 1 that the gender variable weights are zero resulted in an $F = 192.9$ (1, 1614) and the restriction is not true, $p<.001$. There are significant gender differences holding ethnicity, source, and years of education constant. As shown, there are also significant ethnicity and source differences.

The source effects are the greatest, and those differences are most important for the purpose of the current investigation. After taking into account gender, ethnicity, and education differences, the source differences are dramatic, i.e. the R^2 for the full model (R^2=.364) drops to .178 when the source variables are removed from the set of predictor variables. This result suggests that where there are large differences between sources, as in enlisted versus officer, common selection systems should use independent norms and minimum standards. When AFOQT Form N was normed, education level standards and norms were used to rank candidates (Gould, 1978). Even though the same 1978 data were used to norm Forms O through Q, the education level conversion tables were dropped and a common table used because of administration issues.

The race and gender differences are consistent with past studies of cognitive measurement differences in minority and majority gender and race groups. In this case the difference persists even though Form S was found to minimize those differences compared to Forms Q and R (Gould & Shore, 2003). Recent studies in group differences have indicated that these results may be caused by statistical artifacts when there are large differences in size of the minority and majority groups, as exists here; 80 percent of the sample is male and 79 percent of the sample is White (Charness & Gerchak, 1996).

The summary characteristics of all the variables used in the regression analyses and the intercorrelations are included in Appendix A. In addition, all the AFOQT subtests and composites characteristics and intercorrelations are in Appendix A for those wishing to examine the relationships between the measures or to conduct additional regression analyses.

ASVAB and AFOQT

The ASVAB data available for this sample consisted of 10 subtests: General Science (GS), Arithmetic Reasoning (AR), Word Knowledge (WK), Paragraph Comprehension (PC), Numerical Operations (NO), Coding Speed (CS), Auto and Shop Information (AS), Math Knowledge (MK), Mechanical Comprehension (MC), and Electrical Information (EI). There is an apparent eleventh subtest called VE, but it is simply a combination of WK and PC and is an indicator of verbal ability much like the Verbal Composite of the AFOQT. For making classification decisions from the ASVAB, the Air Force uses four ASVAB composite scores: General, Mechanical, Administrative, and Electronic. Effective January 2002, NO and CS were removed from the ASVAB and Assembling Objects (AO) was added. Because the available sample entered the Air Force and was tested on the ASVAB and AFOQT in 2001 before the change occurred, AO scores were not available for analysis. The characteristics of the sample on the AFOQT and ASVAB subtests and composites and the intercorrelations of the composites and subtests are contained in Appendix B.

A critical issue concerns the possibility of using the ASVAB to predict performance in helicopter pilot training either as a substitute for a test with a pilot composite or as an interim indicator of who might do well on such a test. Regression analyses were conducted to develop an ASVAB predictor of the AFOQT new Pilot Composite. Table 8 shows the results of using the ASVAB subtest to predict the new Pilot Composite for the 406 enlisted airmen in the AFOQT normative sample. The multiple R was .77. Thus, at best the ASVAB can account for 60 percent of the variance in the new Pilot Composite ($R^2 = .60$). The standard error of the estimate (*SE*) was 15.54. Because the NO and CS will not be available for more recent Army enlisted applicants, the regression equations were recalculated without these two subtests. After the removal of the NO and CS subtests, the variance accounted for drops to 57 percent ($R^2 = .574$, $R = .757$ and $SE = 16.01$). The regression coefficients are shown in Table 9. ASVAB subtest scores may not be readily available for operational use, but predicting the new Pilot Composite from available Army composite scores would lower the predictive efficiency even more unless the new AO subtest contributes substantial variance to the predictive equation. Using the ASVAB subtests to predict the old Pilot Composite only accounts for 49.6 percent of the variance. Thus predicting the old composite is not an option.

Table 8

Regression Coefficients Predicting the AFOQT New Pilot Composite from ASVAB Subtests

Regression Statistics		
Subtest	*Coefficient*	*Standard Error*
Intercept	-187.01	15.80
GS STD	0.72	0.20
AR STD	1.02	0.21
WK STD	-2.19	1.49
PC STD	-0.85	0.69
NO STD	0.23	0.15
CS STD	0.45	0.13
AS STD	0.25	0.14
MK STD	0.79	0.17
MC STD	0.69	0.15
EI STD	0.36	0.17
VE STD	3.39	2.09

Note: More detail on the regression equation and values are given in Appendix B. STD = a standard T score with a mean of 50 and a *SD* of 10.

Table 9

Regression Coefficients Predicting AFOQT New Pilot Composite from ASVAB Subtests Without NO and CS

	Regression Statistics	
Subtest	*Coefficient*	*Standard Error*
Intercept	-165.547	15.573
GS STD	0.689	0.202
AR STD	1.224	0.210
WK STD	-1.267	1.529
PC STD	-0.313	0.710
AS_STD	0.160	0.144
MK STD	0.930	0.170
MC STD	0.651	0.152
EI STD	0.365	0.170
VE STD	2.034	2.146

Note: STD = a standard T score with a mean of 50 and a *SD* of 10.

The AFOQT and ASVAB subtest composite intercorrelations in Appendix B reveal that the highest intercorrelation is .79 between the ASVAB's General Composite and the Academic Aptitude Composite (AA) of the AFOQT. The largest surprise is that the correlation between the ASVAB's Administrative Composite (WK+PC+NO+CS) and AFOQT's Verbal Composite is only .39 while the ASVAB's Word Knowledge subtest alone correlates .71 with the AFOQT Verbal Composite. The ASVAB's AFQT composite correlates .83 with the AFOQT's AA composite.

Five subtests in the AFOQT have direct counterparts in the ASVAB: AR, WK, PC (called Reading Comprehension in the AFOQT), MK, and MC. Over the years, test developers for the AFOQT gave the developers of the ASVAB some test items that were too easy or difficult and vice versa. Thus, the counterpart subtests have similar items as well as similar intent. Given the short interval between test administration and the similarity in content and intent of the counterpart subtests, the correlations from the sample between the counterpart subtests were lower than expected: AR = .70, WK = .71, PC/RC = .42, MK = .71 and MC = .55.

Conclusions

As expected, the AFOQT was more difficult for the Air Force enlisted personnel than for other commissioning source applicants. However, the subtest and composite score distributions are sufficient to discriminate well between enlisted personnel if the AFOQT or a similar aptitude test is used for selection. On the highly timed subtests of the Pilot Composite, such as the Instrument Comprehension and Table Reading tests, there is almost no difference between the examinee subpopulations. A common selection system for all Army helicopter pilot applicants appears to be practical, but separate group norms probably will be required so that individual applicants are rank ordered or eliminated based on the applicant's source group. Direct conversion from ASVAB to AFOQT results is not recommended except as an interim estimate of how the enlisted personnel are likely to do on the AFOQT, particularly the new Pilot Composite.

How do the enlisted personnel from the normative sample compare to individuals who are applicants for Army helicopter training? For comparison of the BMT enlisted part of the normative sample to those enlisted personnel applying for Army aviation, the BMT subsample had a mean AFOQT score of 74.1 (*SD* = 13.0). The ASVAB scores will also help gauge the general intelligence level of the personnel in the USAF enlisted sample for comparison with Army data. The results should help the U.S. Army determine the appropriate difficulty level for the cognitive portions of its revised aviator selection battery and the appropriateness of the AFOQT for Army aviator selection.

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APPENDIX A. AFOQT Form R and S Normative Sample Intercorrelations and Variable Characteristics

Table A1
Descriptive Statistics for AFOQT Form R and S Normative Sample

	YRS_ ED	PILOT_ NW	V_ RAW	Q_ RAW	AA_ RAW	P_ RAW	NT_ RAW	VA	AR	RC	DI	WK	MC
Mean	13.663	105.891	45.673	46.815	92.488	122.452	163.799	16.012	15.389	14.433	16.735	15.227	10.394
Median	13	105.8	46	47	93	123	164	16	15	15	17	15	10
Mode	12	116.8	38	46	114	123	162	19	14	14	19	21	9
Std Dev	2.002	29.839	12.828	13.970	24.068	28.136	37.776	4.295	5.337	4.673	4.412	5.890	3.626
Std Err	0.050	0.741	0.318	0.347	0.597	0.698	0.938	0.107	0.132	0.116	0.110	0.146	0.090
Kurtosis	-0.531	-0.767	-0.698	-0.900	-0.769	-0.377	-0.294	-0.487	-0.875	-0.531	-0.213	-1.005	-0.511
Skewness	0.814	-0.011	-0.130	-0.098	-0.136	-0.199	-0.246	-0.260	-0.109	-0.106	-0.512	-0.117	0.068
Minimum	12	28.4	11	7	23	38	46	3	1	2	2	1	1
Maximum	21	177.7	74	75	147	195	257	25	25	25	25	25	20
Count	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623

	MC	EM	SR	IC	BC	TR	AI	RB	GS	HF	AGE	V PCT	Q PCT
Mean	10.394	9.996	25.019	11.539	12.365	27.353	9.773	9.500	12.400	9.955	21.832	47.695	47.365
Median	10	10	25	12	13	28	9	10	13	10	20	45	46
Mode	9	8	25	14	13	29	7	10	14	15	18	62	29
Std Dev	3.626	3.891	7.361	5.340	4.002	7.306	4.473	3.172	3.881	3.523	4.565	29.417	29.148
Std Err	0.090	0.097	0.183	0.133	0.099	0.181	0.111	0.079	0.096	0.087	0.113	0.730	0.724
Kurtosis	-0.511	-0.493	-0.334	-1.118	-0.248	0.033	-0.506	-0.440	-0.542	-0.574	0.406	-1.232	-1.216
Skewness	0.068	0.168	-0.380	-0.215	-0.384	-0.394	0.462	-0.398	-0.269	-0.422	1.181	0.099	0.136
Minimum	1	0	4	0	0	1	0	0	0	0	17	1	1
Maximum	20	20	40	20	20	41	20	15	20	15	39	99	99
Count	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623

	AA PCT	P PCT	NT PCT	MALE	FEMALE	AMER IND	ASIAN	BLACK	HISP	WHITE	BMT	ROTC	OTS
Mean	46.711	46.959	46.847	0.793	0.204	0.007	0.047	0.084	0.069	0.788	0.314	0.402	0.285
Median	45	45	45	1	0	0	0	0	0	1	0	0	0
Mode	1	7	29	1	0	0	0	0	0	1	0	0	0
Std Dev	29.322	28.894	28.982	0.405	0.403	0.086	0.211	0.277	0.254	0.409	0.464	0.490	0.451
Std Err	0.728	0.717	0.719	0.010	0.010	0.002	0.005	0.007	0.006	0.010	0.012	0.012	0.011
Kurtosis	-1.232	-1.192	-1.205	0.095	0.164	130.663	16.459	7.051	9.598	-0.009	-1.355	-1.841	-1.089
Skewness	0.136	0.133	0.131	-1.448	1.471	11.511	4.294	3.007	3.404	-1.411	0.804	0.401	0.955
Minimum	1	1	1	0	0	0	0	0	0	0	0	0	0
Maximum	99	99	99	1	1	1	1	1	1	1	1	1	1
Count	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623

Table A2
Intercorrelations for the AFOQT Form R and S Normative Sample

	YRS_ ED	PILOT_ NW	V_ RAW	Q_ RAW	AA_ RAW	P_ RAW	NT_ RAW	VA	AR	RC	DI	WK	MK
YRS_ED	1.00000												
PILOT_NW	0.14086	1.00000											
V_RAW	0.24449	0.63633	1.00000										
Q_RAW	0.03328	0.80232	0.61270	1.00000									
AA_RAW	0.14972	0.80475	0.88876	0.90680	1.00000								
P_RAW	0.15460	0.92425	0.64630	0.73618	0.77171	1.00000							
NT_RAW	0.08108	0.88287	0.61529	0.88881	0.84369	0.93429	1.00000						
VA	0.16491	0.54075	0.85883	0.54786	0.77586	0.57943	0.52993	1.00000					
AR	0.07157	0.73818	0.56498	0.90495	0.82622	0.67704	0.80911	0.50903	1.00000				
RC	0.10058	0.60829	0.82006	0.57532	0.77110	0.61987	0.61344	0.56794	0.52781	1.00000			
DI	-0.02696	0.67492	0.54169	0.85728	0.78615	0.67923	0.79677	0.47952	0.69637	0.53414	1.00000		
WK	0.33243	0.50915	0.90126	0.47864	0.75835	0.49347	0.46714	0.69076	0.44072	0.57891	0.40649	1.00000	
MK	0.03396	0.72212	0.53076	0.90169	0.80608	0.61828	0.77123	0.47474	0.71202	0.48187	0.64742	0.42762	1.00000
MC	0.09918	0.66430	0.55552	0.55317	0.61715	0.69566	0.67118	0.40719	0.52145	0.64903	0.50206	0.39828	0.45931
EM	0.07673	0.50086	0.32831	0.43067	0.42490	0.61886	0.60029	0.23641	0.40806	0.41118	0.39009	0.21659	0.35629
SR	0.06689	0.65274	0.38967	0.64710	0.58316	0.79373	0.80399	0.34917	0.61324	0.38863	0.60729	0.28585	0.51953
IC	0.12376	0.81947	0.49053	0.50350	0.55367	0.75567	0.62695	0.40976	0.45705	0.47628	0.45346	0.39183	0.43651
BC	0.11110	0.59825	0.37337	0.51038	0.49517	0.73687	0.71255	0.33235	0.47958	0.37922	0.47293	0.27008	0.41796
TR	0.10128	0.59523	0.28184	0.46549	0.42031	0.68808	0.67302	0.24894	0.39808	0.27587	0.44961	0.21352	0.40301
AI	0.14418	0.76089	0.48316	0.39981	0.48960	0.64134	0.49503	0.38055	0.35932	0.47194	0.36861	0.40051	0.34351
RB	-0.06510	0.55000	0.34203	0.48529	0.46390	0.58015	0.63703	0.29423	0.44952	0.38317	0.47518	0.22650	0.38427
GS	0.09307	0.66204	0.66102	0.63397	0.72028	0.61418	0.66945	0.55363	0.55083	0.57509	0.53633	0.57984	0.59757
HF	0.03022	0.54249	0.37177	0.48458	0.47935	0.57470	0.64484	0.32917	0.43432	0.37790	0.43679	0.26997	0.42484
AGE	0.78802	0.05507	0.19213	-0.09500	0.04739	0.09110	-0.01772	0.10307	-0.02075	0.06420	-0.11476	0.29235	-0.11960
V PCT	0.24697	0.63338	0.98734	0.60991	0.88039	0.64086	0.61127	0.84702	0.56428	0.79604	0.53559	0.90136	0.52937
Q PCT	0.03396	0.79254	0.60697	0.99118	0.89863	0.72315	0.87665	0.53650	0.90099	0.57486	0.83697	0.47483	0.89959
AA PCT	0.14725	0.79380	0.87595	0.89895	0.98862	0.75565	0.82999	0.75854	0.82225	0.75876	0.77054	0.75286	0.80279
P PCT	0.16780	0.91543	0.64175	0.72524	0.76294	0.97928	0.91179	0.57081	0.67543	0.61597	0.65695	0.49293	0.61054
NT PCT	0.09209	0.87504	0.61229	0.88660	0.84081	0.91117	0.97839	0.52615	0.81684	0.60908	0.77548	0.46683	0.77491
MALE	0.02266	0.29854	0.13405	0.17451	0.17271	0.26531	0.22222	0.07545	0.22161	0.18951	0.16034	0.08665	0.09203
FEMALE	-0.02406	-0.29411	-0.12914	-0.16963	-0.16727	-0.26049	-0.21638	-0.07585	-0.21711	-0.17936	-0.15334	-0.08372	-0.08982
AMER IND	-0.01436	-0.04388	-0.02929	-0.03675	-0.03694	-0.05301	-0.05091	-0.00365	-0.03073	-0.03432	-0.04890	-0.03392	-0.02248
ASIAN	0.06619	-0.03822	-0.04800	-0.00392	-0.02788	-0.04936	-0.02216	-0.06190	-0.01546	-0.03709	-0.02423	-0.02997	0.02270
BLACK	0.01715	-0.24728	-0.19533	-0.18967	-0.21419	-0.27871	-0.25605	-0.13416	-0.18401	-0.21286	-0.19307	-0.15878	-0.13724
HISP	0.01839	-0.09974	-0.09024	-0.08801	-0.09918	-0.10490	-0.09229	-0.11522	-0.08983	-0.08302	-0.09460	-0.04667	-0.05595
WHITE	-0.06156	0.26756	0.22026	0.20059	0.23383	0.30143	0.26414	0.19904	0.20430	0.22498	0.21611	0.15616	0.12752
BMT	-0.34005	-0.45724	-0.37711	-0.41489	-0.44178	-0.36966	-0.37582	-0.31474	-0.32533	-0.27946	-0.26284	-0.37015	-0.48825
ROTC	-0.46427	0.25647	0.10840	0.33043	0.24947	0.15571	0.23887	0.12166	0.20177	0.15086	0.25181	0.02775	0.40890
OTS	0.85332	0.19078	0.26935	0.06697	0.18251	0.21032	0.12632	0.19093	0.11479	0.12299	-0.00370	0.34981	0.05704

	MC	EM	SR	IC	BC	TR	AI	RB	GS	HF	AGE	V PCT	Q PCT
YRS_ED													
PILOT_NW													
V_RAW													
Q_RAW													
AA_RAW													
P_RAW													
NT_RAW													
VA													
AR													
RC													
DI													
WK													
MK													
MC	1.00000												
EM	0.41624	1.00000											
SR	0.44435	0.41865	1.00000										
IC	0.58532	0.41121	0.46904	1.00000									
BC	0.44283	0.46068	0.54718	0.48840	1.00000								
TR	0.27023	0.31910	0.54817	0.32118	0.51902	1.00000							
AI	0.54460	0.34623	0.34540	0.60025	0.33129	0.21073	1.00000						
RB	0.49573	0.39316	0.44771	0.48456	0.48569	0.29733	0.38809	1.00000					
GS	0.60348	0.35850	0.39938	0.51229	0.35451	0.25945	0.52085	0.40033	1.00000				
HF	0.40796	0.38503	0.44334	0.46507	0.46568	0.37554	0.31913	0.51388	0.40629	1.00000			
AGE	0.10198	0.04460	0.01050	0.08908	0.04876	0.03967	0.12026	-0.09628	0.00094	-0.04154	1.00000		
V PCT	0.56091	0.31672	0.39009	0.49266	0.36644	0.27643	0.47782	0.34539	0.65903	0.36440	0.19454	1.00000	
Q PCT	0.54739	0.43684	0.63481	0.49406	0.49748	0.45078	0.39508	0.47679	0.62865	0.47275	-0.09357	0.60707	1.00000
AA PCT	0.61005	0.41794	0.57406	0.54584	0.47754	0.40599	0.48050	0.45601	0.70916	0.46669	0.04349	0.88302	0.90386
P PCT	0.68531	0.61927	0.76839	0.75671	0.70989	0.65740	0.64192	0.56341	0.60566	0.55870	0.09938	0.64472	0.72431
NT PCT	0.66448	0.59560	0.77878	0.62558	0.68289	0.63563	0.49335	0.61501	0.66264	0.62525	-0.00746	0.61521	0.89131
MALE	0.37730	0.18723	0.15615	0.35585	0.14648	0.00451	0.30730	0.27717	0.23535	0.08377	0.09262	0.14360	0.17544
FEMALE	-0.37054	-0.18394	-0.15155	-0.35333	-0.14697	0.00193	-0.30564	-0.27508	-0.23074	-0.08042	-0.09141	-0.13849	-0.17041
AMER IND	-0.02337	-0.03149	-0.05349	-0.02621	-0.05662	-0.04970	-0.03264	-0.03651	-0.01266	-0.01531	-0.02043	-0.03321	-0.03493
ASIAN	-0.05814	-0.03380	-0.03832	-0.05182	-0.00310	0.01441	-0.07036	-0.05569	-0.02375	0.00513	0.06583	-0.04874	-0.00335
BLACK	-0.24622	-0.17009	-0.22413	-0.23922	-0.21900	-0.15853	-0.16780	-0.16281	-0.21368	-0.12337	0.00350	-0.19019	-0.18861
HISP	-0.08162	-0.05783	-0.06921	-0.07210	-0.07284	-0.04512	-0.09389	-0.04871	-0.08852	-0.03005	0.00102	-0.08343	-0.08173
WHITE	0.26060	0.17843	0.24131	0.24815	0.21360	0.14427	0.21867	0.18954	0.22222	0.10917	-0.04019	0.21329	0.19576
BMT	-0.21311	-0.23713	-0.23633	-0.33209	-0.18848	-0.20634	-0.35297	-0.12653	-0.38682	-0.22595	-0.18840	-0.37990	-0.42106
ROTC	0.07631	0.09197	0.11756	0.15032	0.03862	0.09311	0.16129	0.15447	0.26213	0.15945	-0.54946	0.10599	0.33101
OTS	0.13587	0.14351	0.11490	0.17761	0.15152	0.11066	0.18713	-0.03789	0.11234	0.05874	0.79018	0.27483	0.07268

	AA PCT	P PCT	NT PCT	MALE	FEMALE	AMER IND	ASIAN	BLACK	HISP	WHITE	BMT	ROTC	OTS
YRS_ED													
PILOT_NW													
V_RAW													
Q_RAW													
AA_RAW													
P_RAW													
NT_RAW													
VA													
AR													
RC													
DI													
WK													
MK													
MC													
EM													
SR													
IC													
BC													
TR													
AI													
RB													
GS													
HF													
AGE													
V PCT													
Q PCT													
AA PCT	1.00000												
P PCT	0.76104	1.00000											
NT PCT	0.84390	0.92373	1.00000										
MALE	0.17668	0.27865	0.23843	1.00000									
FEMALE	-0.17057	-0.27373	-0.23269	-0.99060	1.00000								
AMER IND	-0.03716	-0.05265	-0.04402	0.00868	-0.00807	1.00000							
ASIAN	-0.02787	-0.05097	-0.02519	-0.07371	0.06858	-0.01917	1.00000						
BLACK	-0.20609	-0.27003	-0.25204	-0.10317	0.10054	-0.02615	-0.06716	1.00000					
HISP	-0.08978	-0.09974	-0.08837	-0.03602	0.03830	-0.02343	-0.06017	-0.08210	1.00000				
WHITE	0.22296	0.29246	0.25925	0.12618	-0.12336	-0.16668	-0.42809	-0.58412	-0.52332	1.00000			
BMT	-0.44285	-0.38766	-0.40188	0.01626	-0.02110	-0.01162	-0.01095	0.03612	0.01755	-0.02564	1.00000		
ROTC	0.24940	0.15363	0.24317	-0.07690	0.08361	0.01718	-0.03922	-0.03057	-0.00336	0.04636	-0.55312	1.00000	
OTS	0.18368	0.23106	0.14840	0.06684	-0.06916	-0.00673	0.05383	-0.00387	-0.01437	-0.02403	-0.42570	-0.51839	1.00000

APPENDIX B. AFOQT 2001 Normative Sample that has ASVAB Scores Available: Variable Characteristics and Intercorrelations

Table B1
Descriptive Statistics for AFOQT 2001 Normative Sample with AFOQT

	YRS_ ED	PILOT_ NW	V_ RAW	Q_ RAW	AA_ RAW	P_ RAW	NT_ RAW	VA	AR	RC	DI	WK	MC
Mean	13.663	105.891	45.673	46.815	92.488	122.452	163.799	16.012	15.389	14.433	16.735	15.227	10.394
Median	13	105.8	46	47	93	123	164	16	15	15	17	15	10
Mode	12	116.8	38	46	114	123	162	19	14	14	19	21	9
Std Dev	2.002	29.839	12.828	13.970	24.068	28.136	37.776	4.295	5.337	4.673	4.412	5.890	3.626
Std Err	0.050	0.741	0.318	0.347	0.597	0.698	0.938	0.107	0.132	0.116	0.110	0.146	0.090
Kurtosis	-0.531	-0.767	-0.698	-0.900	-0.769	-0.377	-0.294	-0.487	-0.875	-0.531	-0.213	-1.005	-0.511
Skewness	0.814	-0.011	-0.130	-0.098	-0.136	-0.199	-0.246	-0.260	-0.109	-0.106	-0.512	-0.117	0.068
Minimum	12	28.4	11	7	23	38	46	3	1	2	2	1	1
Maximum	21	177.7	74	75	147	195	257	25	25	25	25	25	20
Count	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623	1623

	MK_ STD	MC_ STD	EI_ STD	VE_ STD	MECH	ADMIN	GEN	ELEC	AFQT	VA	AR	RC	DI
Mean	59.000	57.212	53.963	56.406	65.680	75.313	75.067	74.264	75.542	14.722	13.631	12.943	15.640
Std Err	0.301	0.374	0.326	0.164	0.963	0.920	0.690	0.683	0.665	0.207	0.247	0.226	0.201
Median	60	57	53	56	67.5	79	74	74	75	14	13	13	15
Mode	66	63	56	54	72	99	62	67	84	15	11	12	15
Std Dev	6.071	7.537	6.577	3.313	19.405	18.540	13.901	13.760	13.391	4.181	4.978	4.560	4.059
Kurtosis	-0.280	-0.587	-0.156	-0.056	-0.403	0.023	-0.749	-0.574	-0.835	-0.521	-0.672	-0.542	-0.320
Skewness	-0.531	-0.374	-0.210	-0.295	-0.407	-0.853	-0.011	-0.180	-0.020	0.151	0.273	0.101	-0.180
Minimum	40	38	34	44	12	10	27	39	38	4	2	3	4
Maximum	68	70	69	62	99	99	99	99	99	25	25	24	24
Count	406	406	406	406	406	406	406	406	406	406	406	406	406

	WK	MK	MC	EM	SR	IC	BC	TR	AI	RB	GS	HF	AGE
Mean	12.869	11.500	9.623	8.916	23.145	9.638	11.616	25.833	8.005	9.291	10.835	9.232	20.631
Std Err	0.278	0.259	0.170	0.186	0.331	0.245	0.193	0.332	0.171	0.146	0.178	0.175	0.129
Median	12	10	10	9	24	9	12	26	8	10	11	10	20
Mode	9	9	9	9	27	12	12	29	7	10	11	10	20
Std Dev	5.609	5.213	3.422	3.742	6.672	4.932	3.886	6.685	3.453	2.941	3.596	3.519	2.592
Kurtosis	-0.767	-0.251	-0.585	-0.563	-0.513	-0.993	-0.353	0.113	0.698	-0.337	-0.520	-0.621	2.602
Skewness	0.255	0.626	0.090	0.146	-0.071	0.129	-0.129	-0.189	0.770	-0.359	0.056	-0.306	0.689
Minimum	1	1	1	0	6	0	1	2	1	1	1	0	7
Maximum	25	25	18	19	39	20	20	41	19	15	20	15	31
Count	406	406	406	406	406	406	406	406	406	406	406	406	406

	YRSED	PILOT_ NW	MALE	FEMALE	AMER IND	ASIAN	BLACK	HISP	WHITE
Mean	12.862	91.213	0.793	0.207	0.007	0.039	0.091	0.064	0.793
Std Err	0.070	1.202	0.020	0.020	0.004	0.010	0.014	0.012	0.020
Median	12	87.75	1	0	0	0	0	0	1
Mode	12	116.8	1	0	0	0	0	0	1
Std Dev	1.409	24.229	0.406	0.406	0.086	0.195	0.288	0.245	0.406
Kurtosis	3.947	-0.203	0.110	0.110	131.975	20.685	6.164	10.831	0.110
Skewness	1.928	0.482	-1.453	1.453	11.547	4.752	2.852	3.575	-1.453
Minimum	12	28.4	0	0	0	0	0	0	0
Maximum	21	163.9	1	1	1	1	1	1	1
Count	406	406	406	406	406	406	406	406	406

Table B2
Intercorrelations for AFOQT 2001 Normative Sample with AFOQT

	V_ RAW	Q_ RAW	AA_ RAW	P_ RAW	NT_ RAW	GS_ STD	AR_ STD	WK_ STD	PC_ STD	NO_ STD	CS_ STD	AS_ STD
V_RAW	1.00000											
Q_RAW	0.62728	1.00000										
AA_RAW	0.90230	0.90174	1.00000									
P_RAW	0.63120	0.69985	0.73777	1.00000								
NT_RAW	0.60493	0.86487	0.81453	0.92591	1.00000							
GS_STD	0.65442	0.50071	0.64041	0.52004	0.53457	1.00000						
AR_STD	0.41896	0.73038	0.63686	0.54107	0.65211	0.36826	1.00000					
WK_STD	0.70553	0.38832	0.60657	0.34359	0.34282	0.55763	0.22901	1.00000				
PC_STD	0.54316	0.44846	0.54973	0.36323	0.40792	0.43994	0.34650	0.47157	1.00000			
NO_STD	0.18111	0.33393	0.28538	0.24786	0.30190	0.04773	0.31603	0.08237	0.12219	1.00000		
CS_STD	0.19619	0.28888	0.26881	0.31904	0.33705	0.05961	0.23259	0.07869	0.16716	0.52356	1.00000	
AS_STD	0.19972	0.15188	0.19493	0.38505	0.31269	0.33259	0.24076	0.14111	0.10719	-0.11408	-0.14412	1.00000
MK_STD	0.42712	0.65755	0.60107	0.40440	0.52659	0.32423	0.55769	0.29597	0.25310	0.36823	0.27384	-0.06320
MC_STD	0.39863	0.42628	0.45724	0.55952	0.56181	0.51324	0.43586	0.26309	0.30235	0.00900	-0.03770	0.57798
EI_STD	0.46147	0.35719	0.45387	0.46572	0.43821	0.56583	0.31560	0.38190	0.25305	-0.02730	0.01134	0.54557
VE_STD	0.75595	0.47268	0.68125	0.40447	0.41774	0.59461	0.31438	0.93974	0.72752	0.10308	0.11233	0.14532
MECH	0.41238	0.35045	0.42289	0.55403	0.51018	0.62577	0.38017	0.31138	0.26849	-0.06323	-0.09005	0.90124
ADMIN	0.38983	0.45149	0.46630	0.40793	0.44832	0.21051	0.37309	0.32604	0.33522	0.83091	0.84028	-0.09991
GEN	0.66716	0.76443	0.79348	0.59059	0.68008	0.55581	0.89250	0.61523	0.60201	0.28645	0.22791	0.24685
ELEC	0.65626	0.73533	0.77132	0.64093	0.70978	0.76415	0.73343	0.49909	0.42875	0.21823	0.18821	0.36826
AFQT	0.70498	0.78510	0.82590	0.57155	0.67268	0.56308	0.76919	0.66588	0.58826	0.33228	0.26322	0.13008
VA	0.85599	0.53717	0.77248	0.58355	0.51033	0.53695	0.34903	0.57736	0.46575	0.16188	0.21615	0.13519
AR	0.54260	0.88527	0.79123	0.63818	0.77802	0.41717	0.69810	0.29668	0.39739	0.28970	0.22060	0.21455
RC	0.82623	0.53722	0.75599	0.59830	0.58829	0.53780	0.35711	0.50522	0.41688	0.18154	0.13222	0.31617
DI	0.52796	0.82563	0.75009	0.60430	0.72793	0.37670	0.57350	0.34152	0.43034	0.27380	0.26197	0.13996
WK	0.89558	0.54622	0.79947	0.47063	0.47542	0.60574	0.37347	0.71482	0.51176	0.13116	0.16406	0.08264
MK	0.55523	0.87826	0.79436	0.57626	0.73696	0.49324	0.61525	0.36973	0.34672	0.30041	0.26899	0.04557
MC	0.49464	0.48674	0.54400	0.62035	0.62085	0.50995	0.41403	0.29446	0.28996	0.04756	-0.00154	0.59954
EM	0.27307	0.36757	0.35504	0.58449	0.55616	0.22707	0.22903	0.07720	0.12149	0.01829	0.11279	0.28038
SR	0.35962	0.56746	0.51374	0.74503	0.74811	0.32492	0.44889	0.17251	0.20334	0.21309	0.27528	0.21281
IC	0.44092	0.39762	0.46485	0.67400	0.52414	0.46270	0.31995	0.25135	0.23708	0.05446	0.01249	0.38297
BC	0.33210	0.46947	0.44422	0.71321	0.69041	0.28748	0.39749	0.18212	0.29827	0.15133	0.20352	0.24729
TR	0.18214	0.38418	0.31377	0.59739	0.58892	0.07267	0.30139	0.03547	0.10589	0.38746	0.53040	-0.00482
AI	0.46857	0.34674	0.45202	0.56291	0.42224	0.42296	0.28577	0.32315	0.24359	0.03212	0.00655	0.35999
RB	0.30708	0.38604	0.38414	0.52766	0.57340	0.35270	0.30529	0.18448	0.25069	0.01175	0.07091	0.34209
GS	0.63963	0.56665	0.66871	0.57445	0.62803	0.70923	0.41432	0.49322	0.45732	0.06269	0.03681	0.32710
HF	0.30774	0.38626	0.38463	0.50406	0.58146	0.34998	0.27068	0.18048	0.18859	0.16886	0.12828	0.18472
AGE	0.21204	0.05063	0.14572	0.08405	0.05093	0.14038	0.10201	0.19772	0.13822	0.12445	0.18666	0.12536
YRSED	0.20014	0.12103	0.17809	0.05081	0.06515	0.12709	0.10071	0.17065	0.10980	0.13978	0.18588	-0.09272
PILOT_NW	0.63430	0.78563	0.78697	0.89938	0.86003	0.55265	0.60915	0.37023	0.37681	0.27503	0.26569	0.33262

	MK_ STD	MC_ STD	EI_ STD	VE_ STD	MECH	ADMIN	GEN	ELEC	AFQT	VA	AR	RC	DI
V_RAW													
Q_RAW													
AA_RAW													
P_RAW													
NT_RAW													
GS_STD													
AR_STD													
WK_STD													
PC_STD													
NO_STD													
CS_STD													
AS_STD													
MK_STD	1.00000												
MC_STD	0.17959	1.00000											
EI_STD	0.21310	0.52837	1.00000										
VE_STD	0.32700	0.31791	0.38914	1.00000									
MECH	0.09656	0.81808	0.65738	0.33834	1.00000								
ADMIN	0.43288	0.06334	0.09453	0.36818	0.00607	1.00000							
GEN	0.57133	0.47355	0.41680	0.70659	0.44281	0.45423	1.00000						
ELEC	0.70410	0.56176	0.73095	0.54761	0.60562	0.36274	0.80588	1.00000					
AFQT	0.80852	0.39089	0.39400	0.73891	0.34441	0.50930	0.92342	0.84718	1.00000				
VA	0.38151	0.34651	0.35766	0.62812	0.32363	0.35694	0.55321	0.54367	0.59701	1.00000			
AR	0.51559	0.44665	0.35564	0.38263	0.37489	0.36422	0.69764	0.65366	0.66816	0.47729	1.00000		
RC	0.29396	0.41885	0.41423	0.54671	0.46810	0.30506	0.52397	0.53665	0.52599	0.57496	0.45536	1.00000	
DI	0.45433	0.34556	0.23298	0.42623	0.28759	0.39464	0.62700	0.52971	0.61667	0.46480	0.62228	0.46997	1.00000
WK	0.41858	0.28032	0.41433	0.75446	0.28765	0.34563	0.63298	0.60574	0.68209	0.67492	0.47065	0.58055	0.43578
MK	0.70998	0.31321	0.32425	0.42133	0.24742	0.41335	0.65463	0.70350	0.73972	0.45352	0.65551	0.47055	0.58101
MC	0.21526	0.58882	0.54518	0.34461	0.69390	0.11700	0.46931	0.56551	0.41009	0.33803	0.47352	0.59888	0.43419
EM	0.14324	0.35049	0.29826	0.11089	0.34895	0.10295	0.22178	0.30895	0.20259	0.19957	0.39081	0.35336	0.27081
SR	0.32136	0.32642	0.22268	0.20675	0.31939	0.31183	0.42937	0.43118	0.40603	0.32931	0.53100	0.34965	0.48684
IC	0.20582	0.51083	0.39984	0.29249	0.52971	0.11601	0.37519	0.46633	0.34890	0.38929	0.35436	0.40573	0.36377
BC	0.22710	0.43258	0.28127	0.25168	0.37285	0.25755	0.41336	0.39457	0.36955	0.30844	0.42341	0.33206	0.40968
TR	0.30332	0.10627	0.07983	0.05848	0.05301	0.50753	0.24929	0.24006	0.27202	0.15451	0.29943	0.20566	0.34658
AI	0.19365	0.41320	0.43476	0.34647	0.45763	0.10582	0.37416	0.44754	0.35753	0.41369	0.33109	0.41623	0.27817
RB	0.15127	0.51572	0.34840	0.23311	0.47898	0.10256	0.33808	0.39556	0.29069	0.27986	0.37447	0.34199	0.34199
GS	0.40550	0.53360	0.52403	0.55282	0.55403	0.19339	0.56808	0.68697	0.59631	0.51744	0.48671	0.55722	0.47881
HF	0.21603	0.47059	0.23373	0.20455	0.34977	0.20846	0.29727	0.35250	0.29482	0.26471	0.34744	0.31244	0.30461
AGE	0.07250	0.05837	0.16810	0.20500	0.12519	0.21381	0.17325	0.16841	0.16670	0.13085	0.06212	0.14363	-0.01219
YRSED	0.24704	-0.03165	0.06526	0.18655	-0.03674	0.21543	0.16168	0.18269	0.23438	0.12464	0.08986	0.08485	0.03189
PILOT_NW	0.50942	0.54574	0.48282	0.43276	0.52169	0.39984	0.65473	0.71221	0.65619	0.54995	0.72052	0.56955	0.60991

	DI	WK	MK	MC	EM	SR	IC	BC	TR	AI	RB	GS
V_RAW												
Q_RAW												
AA_RAW												
P_RAW												
NT_RAW												
GS_STD												
AR_STD												
WK_STD												
PC_STD												
NO_STD												
CS_STD												
AS_STD												
MK_STD												
MC_STD												
EI_STD												
VE_STD												
MECH												
ADMIN												
GEN												
ELEC												
AFQT												
VA												
AR												
RC												
DI	1.00000											
WK	0.43578	1.00000										
MK	0.58101	0.50388	1.00000									
MC	0.43419	0.35201	0.36163	1.00000								
EM	0.27081	0.16617	0.28579	0.33231	1.00000							
SR	0.48684	0.26337	0.45676	0.35458	0.34871	1.00000						
IC	0.36377	0.35235	0.31934	0.48439	0.33335	0.31998	1.00000					
BC	0.40968	0.23252	0.38769	0.40487	0.44129	0.46013	0.39995	1.00000				
TR	0.34658	0.11932	0.35337	0.13130	0.22803	0.42707	0.17893	0.40525	1.00000			
AI	0.27817	0.38660	0.28779	0.42027	0.27810	0.26322	0.48077	0.28299	0.07224	1.00000		
RB	0.34199	0.19058	0.28968	0.48836	0.31853	0.34624	0.41134	0.45955	0.18155	0.33660	1.00000	
GS	0.47881	0.57189	0.50338	0.56031	0.30966	0.33850	0.46765	0.33951	0.12345	0.49133	0.34705	1.00000
HF	0.30461	0.22735	0.34512	0.34833	0.29345	0.34870	0.40806	0.38555	0.28328	0.24481	0.42579	0.37247
AGE	-0.01219	0.25331	0.06999	0.07475	-0.00345	0.06023	0.07604	0.00499	0.02050	0.07912	-0.02086	0.05041
YRSED	0.03189	0.27948	0.17577	-0.01900	0.02683	0.01868	0.04147	-0.01376	0.02611	0.05799	-0.06775	0.14315
PILOT_NW	0.60991	0.52589	0.69624	0.56188	0.44481	0.56083	0.75666	0.55111	0.51970	0.69145	0.47897	0.61129

	HF	AGE	YRSED	PILOT_ NW
V_RAW				
Q_RAW				
AA_RAW				
P_RAW				
NT_RAW				
GS_STD				
AR_STD				
WK_STD				
PC_STD				
NO_STD				
CS_STD				
AS_STD				
MK_STD				
MC_STD				
EI_STD				
VE_STD				
MECH				
ADMIN				
GEN				
ELEC				
AFQT				
VA				
AR				
RC				
DI				
WK				
MK				
MC				
EM				
SR				
IC				
BC				
TR				
AI				
RB				
GS				
HF	1.00000			
AGE	0.03079	1.00000		
YRSED	0.00745	0.57281	1.00000	
PILOT_NW	0.47964	0.09250	0.10305	1.00000

Table B3
Regression Summary for AFOQT 2001 Normative Sample with AFOQT

REGRESSION								
Multiple R	0.77362462							
R Square	0.59849505							
Adjusted R Square	0.58719951							
Standard Error	15.5735681							
Observations	403							
ANOVA								
	df	**SS**	**MS**	**F**	**Signif F**			
Regression	11	141358.742	12850.795	52.985	1.39E-70			
Residual	391	94831.586	242.536					
Total	402	236190.327						
	Coefficients	**Standard Error**	**t Stat**	**P-value**	**Lower 95%**	**Upper 95%**	**Lower 95.0%**	**Upper 95.0%**
Intercept	-187.1051	15.8588	-11.7982	0.0000	-218.2843	-155.9259	-218.2843	-155.9259
GS_STD	0.7056	0.1971	3.5802	0.0004	0.3181	1.0931	0.3181	1.0931
AR_STD	1.0323	0.2092	4.9335	0.0000	0.6209	1.4437	0.6209	1.4437
WK_STD	-2	1	-1	0	-5	1	-5	1
PC_STD	-0.7938	0.6978	-1.1377	0.2559	-2.1657	0.5780	-2.1657	0.5780
NO_STD	0.2456	0.1553	1.5815	0.1146	-0.0597	0.5509	-0.0597	0.5509
CS_STD	0.4509	0.1302	3.4638	0.0006	0.1950	0.7068	0.1950	0.7068
AS_STD	0.2384	0.1411	1.6894	0.0919	-0.0391	0.5159	-0.0391	0.5159
MK_STD	0.7819	0.1700	4.5997	0.0000	0.4477	1.1162	0.4477	1.1162
MC_STD	0.7090	0.1479	4.7927	0.0000	0.4181	0.9998	0.4181	0.9998
EI_STD	0.3629	0.1664	2.1808	0.0298	0.0357	0.6900	0.0357	0.6900
VE_STD	3.2236	2.1012	1.5342	0.1258	-0.9075	7.3546	-0.9075	7.3546